ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 11. CHICAGO, SATURDAY, SEPTEMBER 11, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SERVICE THE SOCIETY FOR ELECTRICAL DEVELOPMENT INC. NEW YORK SAFETY DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Application of Hooded Lamps.....459
Publicity as a Means of Increasing Residence Business....460
Increasing Usefulness of Electric Passenger Vehicles.....461
Recognition of Engineers in Public Engineering Work.....461
DEPARTMENTS:
Commercial Practice.....466
Electrical Construction.....471
Public Service Commissions.....476
Questions and Answers.....478
New Electrical and Mechanical Appliances.....487
Latest Approved Fittings.....493
Current Electrical News.....494
Record of Electrical Patents.....497
LEADING ARTICLES:
Electricity in Large Steel Warehouses.....463
Shall the Central Station Sell Appliances.—By J. H. Moseley 466
Wiring and Conduit Work at the Panama-Pacific Exposition.—III.—By A. A. Willoughby.....472
Business Hints for the Dealer and Contractor.—By G. D. Crain, Jr.....475
Avoiding Being at Salesmen's or Solicitor's Mercy.—By Elton J. Buckley.....485
LETTER TO THE EDITOR:
Some Interesting and Important Law About Buying Goods. —By H. A. Miles.....485
MISCELLANEOUS:
Special Illumination of "Made In Baltimore" Exposition...462
An Electrical Garden City in Scotland.....462
Investigations in Leclanche Primary Batteries.....462
Chicago Section, Electric Vehicle Association Resumes Weekly Meetings.....462
Advertisements That Sold Many Irons.....469
Reduced Rates in Pepperell.....469
Problem of Free Lamp Renewals in Boston.....469
Electric Irrigation Proposed for Cape Cod District.....470
A. C. Martin.....470
Fees for Wiring Permits in Boston.....471
Examination of Electricians Held in Massachusetts.....471
Among the Contractors.....471
Daily Government Commerce Reports.....477
Scandinavian Railway Electrification.....480
Street Lighting in Chicago.....481
Water-Power Utilization in the West Considered by Governors 482
Engineers Favor [illegible] to Chairman of New York Constitutional Convention.....484
Projector Lighting for Protection of Bathing Beaches.....485

Copyright, 1915, by Electrical Review Publishing Company, Inc.

APPLICATIONS OF HOODED LAMPS.

In the field of decoration and in the useful arts the opportunities for the application of hooded lamps seem almost unlimited. While every lamp screened to prevent glaring rays striking the observer's eyes is in a sense hooded, the particular class of lighting unit in mind is the small-powered incandescent just enough shielded from observation to call attention to some other object and entirely unobtrusive in itself. Of this class are the whole range of miniature or other low candlepowered units employed in the illumination of instrument dials afloat and ashore, in the concentration of a soft yet compelling pencil of rays upon some feature of a theater wall panel, and in the artistic lighting of dignified signs, signal buttons in hospitals, libraries, offices, and at high-class apartment house doorways.

There is no question that in the future lighting schemes of the best residences low-powered but well-directed lighting of this sort will be effectively employed, and very likely economies of operation will thus be obtained in spaces not ordinarily needing a large flux of light except at certain points. Just as an example, at a recent meeting attended by veterans of the Civil War in an armory a hooded lamp was employed at the foot of a long flight of stairs to facilitate the arrival of the old soldier's at the last step and to save any chance of tripping, electricity thus providing that "last touch" of hospitality which differentiates the thoughtful host from the average householder. These miniature flood lighting effects are extraordinarily effective within their field, and an ingenious central-station lighting salesman will find himself "stumped" if he tries to set a limit to the possible applications of this kind which he can put down in his notebook inside of a few days.

If such an alert salesman and a progressive young architect or interior decorator put their heads together some day, they will soon set an entirely new standard of specialized illumination within their fields of practice. To take one more example, the design of a hooded lamp suitable for operation in following a score or a libretto in the darkened auditorium of an opera house without interfering with one's neighbor would be a distinct triumph. Pocket flashlights are often used in this service. Every such application little by little adds to the popularity of electric service, familiarizes the public with its convenience, and augments the total volume of equipment sales.

PUBLICITY AS A MEANS OF INCREASING RESIDENCE BUSINESS.

In practically every central-station system the supply of electric current to residence customers costs very much more per kilowatt-hour than the supply of current to any other class of business. The consequence of this is that the rates for the residence service are necessarily the highest on the entire schedule of rates. The acquisition of residence business is highly desirable, however. Every central station that professes to be at all progressive aims at the complete electrification of the entire community served, which means the supply of electric current to every household as well as all other buildings. The argument has frequently been made that if residence business were to be brought to the saturation point and business men as well as workmen brought to realize the great advantages of electricity in the household, they would be more readily convinced of its adaptability and utility in business and industrial occupations.

Much has already been done in increasing residence business, particularly in the last few years since the use of higher efficiency lamps has very decidedly reduced the cost of electric lighting, which still remains the main use for electric current in the household. Through liberal advertising and other publicity methods the use of electric appliances has also been steadily increasing. The installment method of payment for wiring of houses already built has also had an important effect in increasing the use of electricity among the older residences. Of all of the publicity methods used, however, it may be said that their primary aim was to create a desire to use electricity in the home. As yet but little effort has been directed in the way of what may be called co-operative publicity to reduce the cost of serving residence customers with the idea of promoting more liberal use of current not only for lighting, but for the great multitude of household appliances now available, and also to promote the connection of practically every residence to the central-station lines.

In the last few years there has been a great change on the part of utilities in their attitude toward publicity, particularly to such publicity as aims to educate the public on some of the intracies of the utility business, and which, therefore, makes clear the reasons why certain policies and practices must be employed. Such publicity has been indulged in at times when the utility was confronted with the renewal of a franchise, or had to meet a demand by the municipality to reduce rates. It has been found that educational publicity at those times has been highly beneficial in creating a better feeling between the public and the utility. In connection with the subject being considered, however, it is suggested that educational publicity may also prove highly advantageous by bringing about an approach to saturation in residence business.

Among the many features to be brought out in a publicity campaign, such as here suggested, are: the relatively high cost of distribution-line construction for the comparatively small load met in residence districts at the present time, the high cost of each service connection including a relatively costly meter, also the high cost of reading meters and rendering the monthly bill, which items in many cases may amount to almost half of the total monthly charge. If these points, as well as the relatively low load-factor of residence service, also the need for the best possible voltage regulation so as to give thoroughly satisfactory lighting, are brought to the attention of the public in a proper manner, it is believed that the residence customers will not only see the reasons why residence service requires the highest charges, but will be willing to co-operate with the central station in reasonable efforts to reduce the cost of this service. This can be done in many ways, for example, by friendly efforts of residents to urge their neighbors to take electric service and thus connect up practically every residence in each block; this will bring about a considerable reduction in the cost of distribution system per customer. Co-operation in bringing the expense of meter reading down may readily be brought about by arrangements whereby the inspector will be insured of ready access to the meter without return calls. Realization that an increase in use of current brings about a reduction in the cost of supplying each unit of energy will promote more liberal use of current, if it is suggested to the users that such reduction will be followed by more favorable rates.

It is just this point which probably will be the stumbling block against this proposal. However, there can be no question but that through decided stimulation of residence business to an approach to the saturation point, the cost of rendering it will be materially reduced. There can also be no question but that if the utility shows its good will toward the public by voluntarily reducing the rates for residence service, particularly the maximum or primary rate, this will have a most beneficial effect in still further building up the residence business. Therefore, a hint thrown out judiciously in such a publicity campaign that the co-operation of the public in promoting residence service will prove beneficial to all the residence customers, is certainly a reasonable way to secure their active co-operation. In many small communities the cost of securing new business is very low because those already served advocate the use of electric service among their neighbors and these gradually fall in line and become patrons of the central-station company. A similar state of affairs can be brought about also in larger communities by means of such a co-operative publicity as here suggested.

Great plans are being made in a nation-wide effort to increase the use of electric current and electrical appliances of all kinds through what will be known as Electrical Prosperity Week. Publicity

along the lines referred to above would be very timely in connection with the promotion of this great national movement. At any rate, it seems reasonable that a judicious trial of the plan might be made at that time.

INCREASING USEFULNESS OF ELECTRIC PASSENGER VEHICLES.

One of the problems which is being encountered in furthering the adoption of the electric passenger vehicle, especially in the larger cities, is that of increasing its usefulness to women drivers for shopping, theatergoing and for miscellaneous driving about the congested business district. The rapidly increasing use of automobiles resulting in serious traffic congestion in the downtown sections of cities has made strict regulation imperative, and practically all cities now have laws denying the privilege of cars standing stationary for any length of time at the curb in city streets. This, undoubtedly, works considerable hardship, especially if one does not have a chauffeur, and as one of the principal claims for popularity of the electric is its simplicity and ease of operation, the large majority of prospective purchasers contemplate driving their own cars. Parking restrictions, therefore, tend to limit the use of the electric for city service, and many dealers have tried in vain to overcome this objection, which is frequently advanced by a prospective purchaser.

In Chicago, where the traffic congestion in its limited business section is one of the city's most serious problems, laws have recently been enacted prohibiting cars standing at the curb for a longer period than one-half hour on certain streets, and prohibiting parking of any duration on other principal streets. Those interested in the advance of the electric vehicle have recently inaugurated, under the auspices of the Chicago Section, Electric Vehicle Association of America, a parking system which promises to practically eliminate this drawback, in so far as the electric vehicle is concerned, and at the same time give the battery vehicle an advantage over its gasoline competitor.

The system, as mentioned in our issue of August 7, provides for the establishing at prominent business houses, preferably on the boulevards, of stations where cars may be left by the owners with competent attendants who drive them to adjacent locations outside of the restricted area, and return them again whenever ordered by the owner. There is no charge for this service, the car owner simply understands that by taking advantage of it he entirely agrees that the driver was acting only in the capacity of the owners' personal agent. The cost of this service is borne principally by the various garages, who, upon contributing to the fund, are supplied with tags which are in turn sent to their customers entitling them to such parking service.

At the meeting of the Chicago Section on September 7, various garage owners reported that their customers are enthusiastic over the new service. While there are over 3,500 electric passenger cars in use in Chicago, indications point that ample provisions can be made to care for all who apply for the service. While dealers are not as yet willing to attribute sales directly to this feature, they are heartily in accord with the plan and are voluntarily offering to contribute to its permanent continuance. This parking service is practically impossible with any but electric cars and full advantage should be taken of this point in advancing the claims for the electric. It is but another instance of the complete service which the industry is prepared to furnish to the user.

RECOGNITION OF ENGINEERS IN PUBLIC ENGINEERING WORK.

When the revision of the Constitution of the State of New York was taken up this spring, a committee of engineers representing national and local engineering societies was organized to present recommendations to the Constitutional Convention seeking to place in the organic law provisions that would insure the engineering work of the state being conducted by competent engineers. This committee presented its recommendations to the Convention. The Convention committees have not seen fit, however, to incorporate all these recommendations in their report to the main body. The committee of engineers has therefore presented an open letter to the Convention through its chairman, which is reprinted in this issue.

This plea emphasizes the importance of the earlier recommendations and urges that full and favorable consideration be given thereto. The matters involved are principally the management of public works, conservation of the State's natural resources and the regulation of public utilities. As was pointed out in these columns editorially in our issue of May 1, 1915, these matters, being chiefly of an engineering nature, should be conducted by engineers qualified for the purpose. The time has passed when the frequently changing political control of engineering work can be tolerated.

The appeal of the committee of engineers should be given favorable consideration and should be heartily endorsed by all engineers, not only in the Empire State but throughout the country. If the suggestions are incorporated in the organic law of the leading commonwealth of the country a long step in advance will have been taken and other states will be more easily led to follow in its footsteps.

At the time of going to press news comes from Albany that the New York Constitutional Convention is about to adjourn *sine die*, having hastened its concluding labors to permit submission of the revised Constitution to the voters of the State. Even though the efforts of the committee of engineers have not been fully successful, a step in advance has been taken by at least partial recognition of the engineer in directing public engineering work. At any rate the committee's work has aroused engineers to action whereby they are ready to uphold the necessity for their services in an executive capacity of this character.

Special Illumination of "Made in Baltimore" Exposition.

When the big door of the Fifth Regiment Armory was raised on September 6 to mark the opening of the second annual "Made in Baltimore" Exposition, which is being held at the Armory until September 29, there was a scene of electrical illumination that rivaled anything heretofore attempted in the city.

In front of the main entrance of the Armory on Hoffman Street a huge electric sign blazed forth, and thousands of incandescent lights formed the letters in "Made in Baltimore Exposition." Inside of the Armory the regular arc lamps were augmented by 10,000 smaller decorative electric lights of various colors.

Each booth was outlined with electric lights placed eight or nine inches apart, in addition to the numerous individual exhibitors' signs. The booths were divided into aisles for the convenience of the spectators, and throughout the entire lengths of these aisles there was placed at every 10 feet a large white column surmounted by a high-candlepower electric light inclosed in a decorative white opalescent globe of special design. The contract was awarded to the Eugene I. Rosenfeld Company, and work was started the latter part of August so that everything was in readiness for the opening night.

An Electrical Garden City in Scotland.

There is what is described as an electrical Garden City at Hazlewood, Dumbreck, a car-ride from Glasgow. It is so described because of the erection there of a number of villas which are installed throughout with electricity for all domestic purposes. The villas comprise four, five, or six apartments and in the chief rooms Carron electric glowing fires are fitted, while the kitchens have electric cookers, and hot-water heaters are placed in the bath-rooms above the taps. The builder of the villas states that from tests made by him in a recent summer month the cost for lighting, heating and cooking for a household of six persons amounted to 16 cents per person per week.

Electrical Progress on the Rand.

During the past year nearly $1,980,000 has been expended by the Victoria Falls and Transvaal Power Company, upon extensions to the Simmerpan power station, the Brakpan station, and upon consumers' substation equipments and transmission lines. The extensions to the air compressing plant at Rosherville have been completed and within the last few weeks the whole of the additions of 33,500 horsepower of electrical plant at Brakpan have been placed in commission. The demand for power is steadily increasing.

Herr Rathenau of the Allgemeine Elektricitäts Gesellschaft of Berlin, whose death occurred a month or two ago in Berlin, was a director of this company up to the outbreak of present war.

Telephone Employees Hold Picnic.

Several hundred employees of the Bell Telephone Company in Springfield and Dayton, O., enjoyed an outing on last Thursday, September 2, at Tecumseh Park, near Springfield, as the guests of the company. Special cars over the Ohio Electric Company carried the crowds to the grounds from both cities, and there was a keen contest between the Dayton and Springfield delegations, each trying to surpass the other in attendance. Reports indicate that it was approximately a draw. A big picnic dinner was naturally the central feature of the outing, which is an annual event, although athletic games and sports served to fill the day.

Sandusky Company Employees Hold Picnic.

Officials and employees of the Sandusky (O.) Gas & Electric Company, went picnicking on August 14, taking their families along for a general romp in the woods bordering on Lake Erie at Rye Beach. The business office was closed at 9 o'clock in the morning, and all employees who could possibly be spared were given a day off. The party, numbering about 150 people, were transported to the Beach in special electric cars furnished at the company's expense, and at the picnic grounds everything was free. The day was passed in bathing, bowling, dancing and disposing of a big picnic dinner.

Municipal Lighting-Plant Bond Issue Declared Invalid.

The $60,000 bond issue of the City of Ellensburg, recently voted for a municipal lighting plant, has been declared invalid by the Oregon Supreme Court, at Olympia, on the ground that the proposition submitted to the voters did not set forth in sufficient detail the conditions of the bond issue. Recently the state of Washington has arranged to purchase these bonds. However, before the bonds were taken over the State insisted upon a test suit. The decision is likely to prove an important one, affecting other similar bond issues.

Investigations in Leclanche Primary Batteries.

A new and commercially valuable investigation of the construction and chemical reactions of the Leclanche cell, the form of primary battery used so extensively for ringing bells, buzzers, etc, and in dry cells operating portable flashlights, bells, igniters, etc., has been undertaken by Ernest G. Crocker, of the graduating class in electrochemistry at Massachusetts Institute of Technology.

The polarization was found to be due to an alkali effect of ammonia, previously referred to hydrogen, and experiments were made with different sizes of the grains of materials contributing the dry battery, and various ratios of one of the materials to the other for efficient work.

It was found that the fineness should be between 1/40 and 1/100 of an inch, and contrary to the custom of some manufacturers, the two constituents should be of the same size. The materials used are carbon and pyrolusite, and the quantity of the latter should be about 60 per cent of the whole mixture.

Mr. Crocker found the best material for removing the alkaline effect is chloride of zinc. The practical result of batteries constructed according to the formulas deduced from the experiments is that they will remain more constant in current production under light continuous use. He further found that no commercial cell is using its materials in the most effective size.

Chicago Section, Electric Vehicle Association Resumes Weekly Meetings.

The first regular meeting of the Chicago Section, Electric Vehicle Association, following the summer vacation period was held at the Hotel Metropole, on September 7. No formal program was arranged, the time being used to discuss the parking system which was inaugurated early in the summer by the Section. Several of the garage owners who are extending free parking service to their patrons highly endorsed the scheme.

Valuation of Springfield Company.

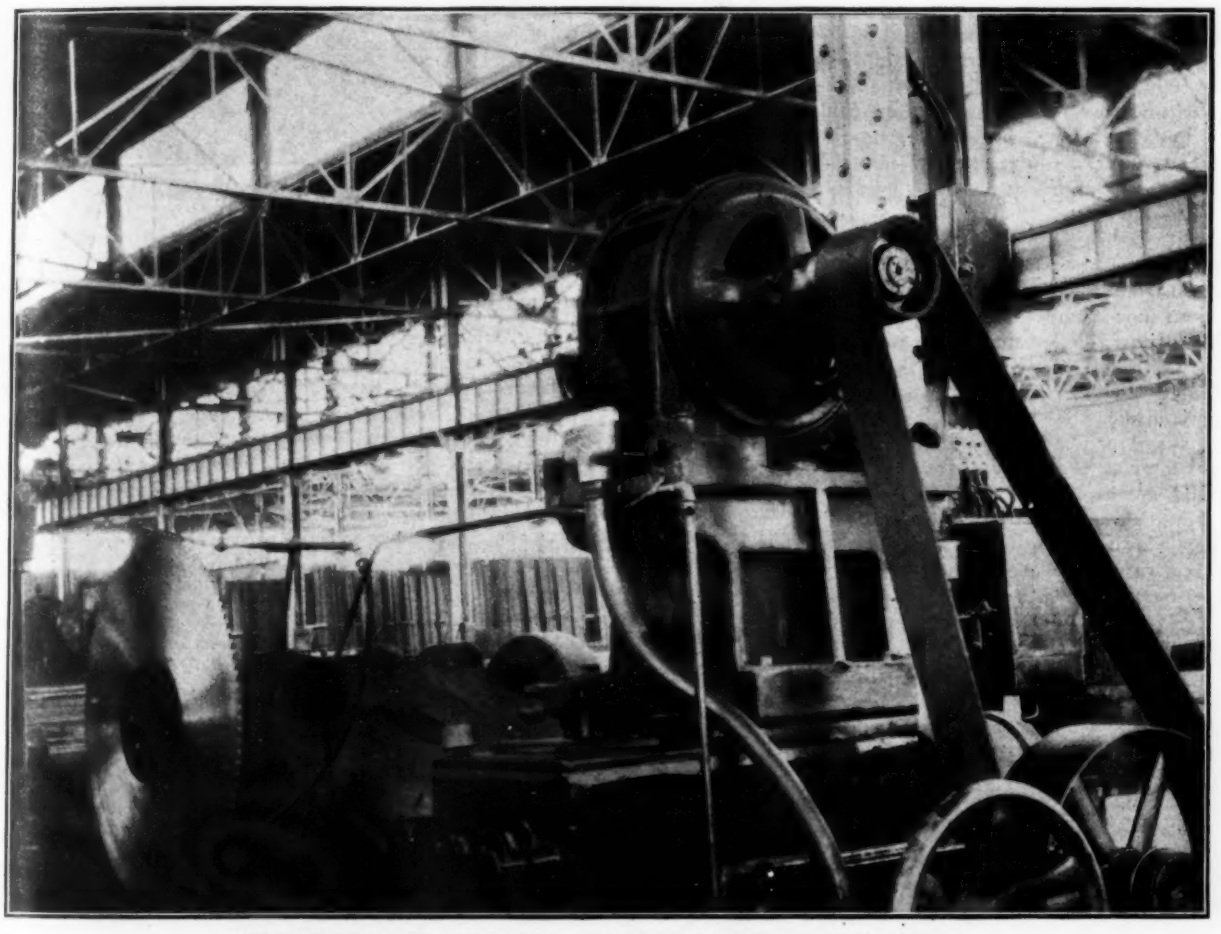
Engineers of the Missouri Public Service Commission began September 1 a valuation of the property of the Springfield (Mo.) Gas & Electric Company. The Commission had employed engineers to make a valuation about two years ago, on which was based its report as to the rates of the company. The present valuation will be used in the defense of the injunction suit now pending in the federal court.

Electricity in Large Steel Warehouses.

This article points out that as the operation in the typical steel warehouse is extremely intermittent, central-station service is the logical and only type. Data are given on the motor equipment of the new Carnegie warehouse at Boston where 490 horsepower in motors are connected.

The New England warehouse of the Carnegie Steel Company, which was recently opened at Allston, Boston, Mass., is a noteworthy example of steel and concrete construction, and its mechanical equipment is of the most approved and efficient type.

This plant is the distributing depot for iron and steel products to all parts of New England and a large portion of Canada, and its location, about four miles from the heart of Boston, and on the main line of the Boston & Albany Railroad, gives ideal facilities both to local consumers and to the entire territory.



Motor Driving a 36-Inch Cold Saw in Carnegie Steel Company's Warehouse.

The building is 340 by 420 feet, and is divided lengthwise into five bays, each 68 feet wide. The walls and roof are of steel and cement, with glass set in steel sash. A two-story concrete office building is now under construction, in front of the storehouse. A locker house, with shower baths and other conveniences, will be provided.

The warehouse has a capacity of 30,000 tons. Machinery installed is for the cutting and splitting of bars, plates, beams, etc., and the twisting of reinforcing rods. A machine shop contains a lathe and emery grinders.

Storage provisions are of an approved type which has been adopted as standard in the four warehouses of the company, at Newark, Baltimore, Pittsburgh and Cleveland. Bars are stacked on end in racks constructed of structural steel and angles, each of the racks being 12 feet high and set in a concrete pit.

In the first bay is located a seven-spindle bar twisting machine of the United Foundry & Engineering Company make, with a capacity of seven rods at a time, of sizes up to 0.75-inch square. This machine is direct-connected to a 75-horsepower induction motor operating at 900/865 revolutions per minute and controlled for variable speed through a street-car type controller mounted at the side of the machine, beside an indicator which shows the number of twists given the rods as the operation proceeds.

At the back of the machine are located the rheostats, which are inclosed on three sides for safety by a structure of angle-iron corner posts 5 feet high, with 0.75-inch-mesh iron wire between, the sides being 2 feet 4 inches wide.

In the second bay, given to merchant bar stock, is a heavy 15-inch bar shear, specially built for this kind of service by the Carnegie Steel Company. This machine is driven by a 10-horsepower motor erected on a platform against one of the steel columns, constructed of a channel-iron base and angle-iron supports and braces. The motor is belted to the machine.

Bay No. 3 is for the storage of plate stock and small shapes, and is provided with a United Engineering & Foundry Company plate shear with a capacity of stock 70 inches wide by

one inch thick, and the splitting of a 60-inch plate. Casters on upright supports, the height of the bed of the shear, extend in rows a distance of 40 feet in front of the machine and 20 feet behind it, facilitating the handling of stock through the shear. The machine is direct-connected to a 30-horsepower motor mounted on the machine, controlled by automatic push buttons.

Other metal-working machines are, a Cleveland Punch & Shear Company gag press, for straightening and shaping beams, bars, channels, etc., driven by a 15-horsepower induction motor mounted on its frame; and a Hilles & Jones double-angle shear, with a capacity of angle irons up to 6 by 6 by 0.75 inches. This machine is geared to a 10-horsepower motor, erected on its frame, and operating at 720 revolutions per minute on no load and 660 under full load. A 36-inch Newton cold saw is operated by a 15-horsepower motor mounted on the machine and direct-connected, running at 1,200 revolutions per minute.

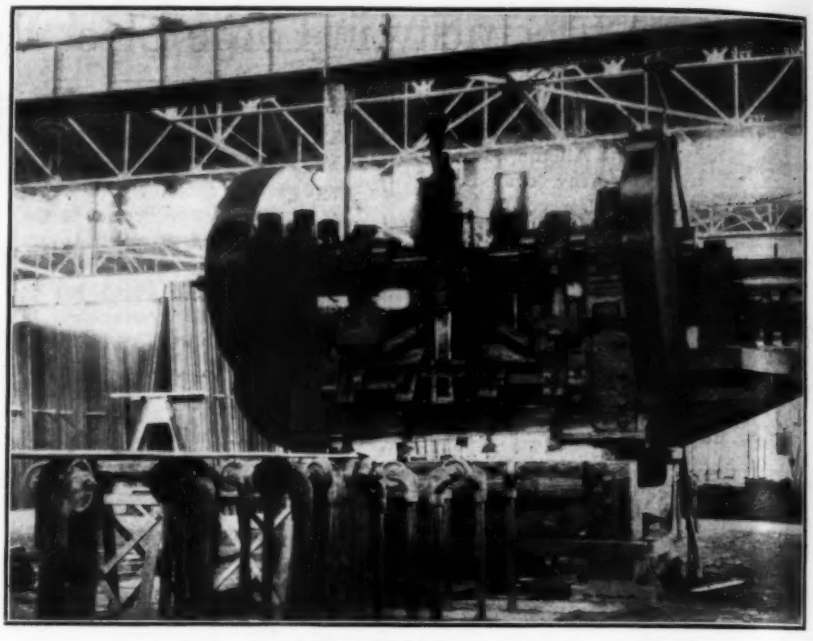
The largest and most impressive machine in the warehouse is a high-speed friction saw, which is located between bays 3 and 4. It has a capacity for cutting I-beams up to 24 inches and 115 feet long. This machine is of the United Engineering & Foundry Company make. It is operated from a platform or "pulpit" 4.5 feet high, which gives the operator of the electrical mechanism a view of the saw table and rollers. Beneath the platform are the rheostats for the variable-speed motors which operate the several moving parts.

A 75-horsepower induction motor drives the 42-inch saw, which is mounted on a sliding frame with a four-foot travel. The frame is driven by a 10-horsepower motor, geared to a screw, giving forward motion of four feet per minute and return at 16 feet per minute. By the introduction of resistance into the motor the low speed of 200 revolutions per minute desired for feed to the saw, was obtained.

The two live roll tables, one line on either side of the saw blade, are 70 and 50 feet in length, respectively. Each is driven by a 20-horsepower reversing motor.

The arbor which carries the saw blade is supported on two sets of ball bearings which are mounted in greased ways, succeeding the former ring oiling, water-cooled type of bearing.

A special four-panel slate switchboard is erected on a structure of angle irons at one side of the operating pulpit. Four knife switches are installed in connection with the starting controllers for the motors, which are of the street-car type. The 75-horsepower saw-blade motor is protected with limit switches which regulate the forward and return stroke.



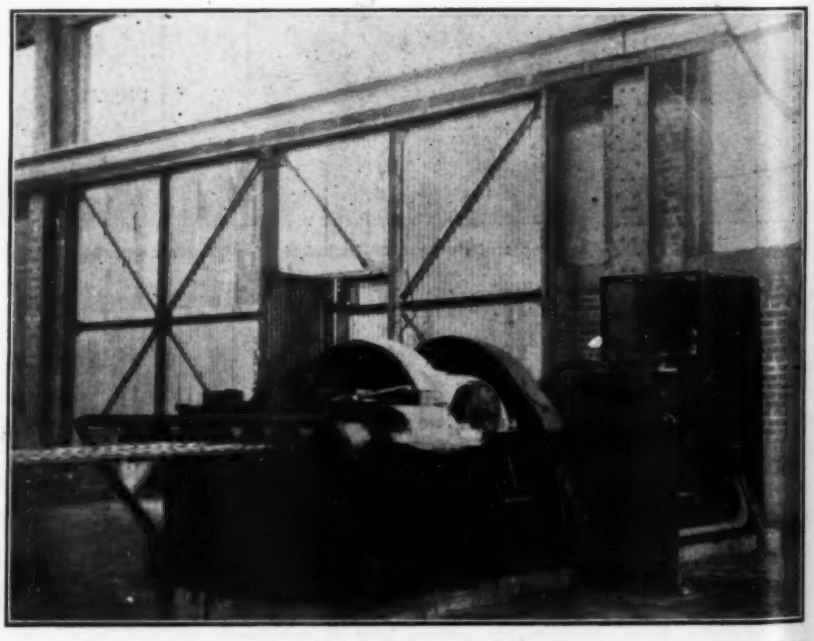
Motor Geared Direct to a 70-Inch Shear—Carnegie Warehouse.

For the edging of the sawblades a four-foot lathe is located at a side of one bay, with saw-blade cutter, or "hob," this being driven by a two-horsepower motor of 1,800 revolutions per minute, located on the floor and belted through cone pulleys to reduce the speed for the rotating of the hob to about 40 revolutions per minute, to secure a careful and accurate milling of the saw teeth.

A double emery grinder, furnished by Manning, Maxwell & Moore, consists of two 2.5 by 18-inch wheels driven on a single direct-connected shaft by a 5-horsepower motor, at 1,130 revolutions per minute on full load. A Newton Machine Tool Works (Philadelphia) single emery wheel is also provided, this being driven by a 0.5-horsepower motor located on the floor.

A 10-ton travelling crane, of Pawling & Harnischfeger manufacture, serves each of four of the bays. These have a span of 68 feet and are provided with two lifts on the trolley. Each lift is operated by a 15-horsepower motor, the trolley travel is by means of a three-horsepower motor, and the bridge travel by one of 15 horsepower.

The cranes are connected by a platform which runs across the ends of the five bays, with stairs of "Safety



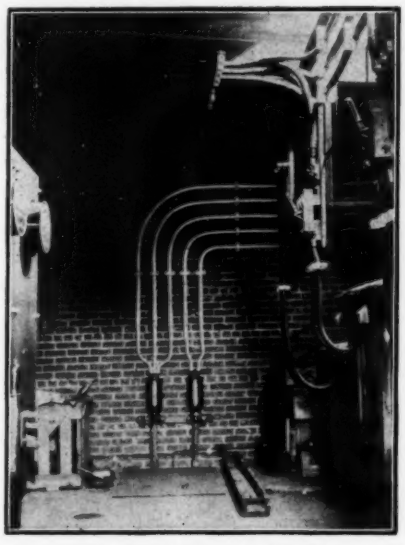
Seven-Spindle Rod-Twisting Machine in Carnegie Warehouse—Motor Driven.

First" construction, the treads being of eight-inch channel iron, the open side upward being filled with cement to give a sure grip for the foot. Throughout the warehouse the safety principle has been adopted, the gears on machines and all exposed electrical parts being securely housed either in sheet iron or netting.

Lighting of the warehouse is by means of 250-watt Mazda lamps pendant from centers of each lateral span, installed in 18-inch shallow concave metal shades, with auxiliary lights, on the side walks, of 150 watts each, similarly shaded. Type C lamps of 300 and 200 watts respectively may later be substituted, this being the original design.

The Edison Electric Illuminating Company of Boston furnishes the power and light supply, to a brick transformer house erected against the south wall of the warehouse, about midway of its length. This structure is 23 by 12 feet and is lighted by a glass and steel monitor.

Here are installed two 100-kilowatt step-down transformers, rated 2,200/220, for power service, and one 50-kilowatt unit rated 2,200/220-110 for lighting service. The transformers stand in a shallow concrete pit which is pitched to drain through an outlet to the city sewer. A Trumbull five-panel slate board contains Weston ammeters, a Pennsylvania Appliance Company reverse-phase relay, and a



Interior of Substation at Warehouse of Carnegie Steel Company, Boston, Mass.

General Electric curve-drawing wattmeter.

The lighting company's services enter the building from underground conduit in lead-sheathed cables and are carried to a brass-jacketed pothead. High-tension cables in the station are painted white, and low-tension cables black, to distinguish between them easily.

The connected load of the motors is about 490 horsepower, but the operation of the machines being intermittent the energy consumption is kept at a low figure. Central-station service for a plant of the kind here described is the logical and only economical type.

Cooking-Appliance Campaign at Augusta.

The Central Maine Power Company, whose head office is at Augusta, is advertising the Universal electric grill at $5, procurable at any of the company's stores. The point is made that the device can be operated from any lamp socket. The following are some of the viands which can advantageously be prepared with its use: Grilled chops, steaks, bacon and omeletts; frying fritters, oysters, croquettes, doughnuts; preparing tea or coffee; toasting bread, crackers, cheese; making candies, popping corn, etc. The company is making a special "drive" for cooking business in its extensive territory.

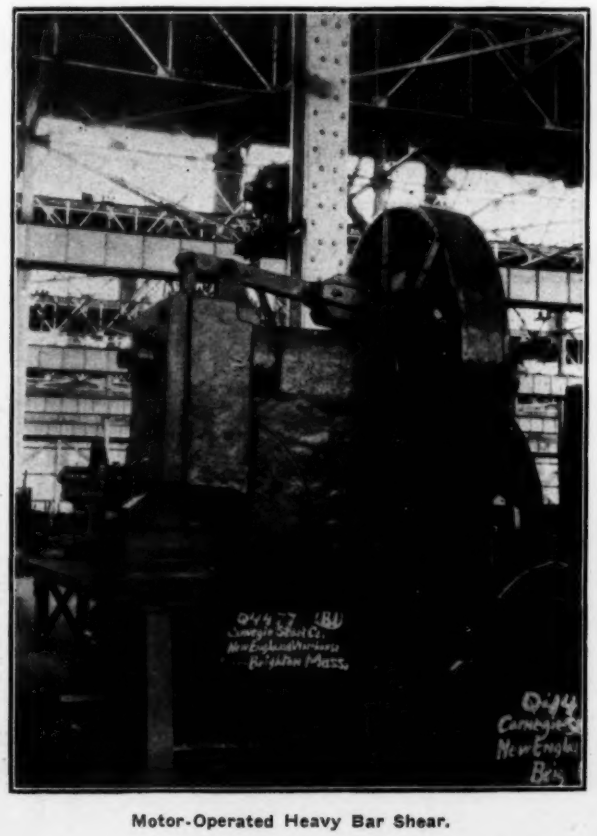
Electric Baking Proves Economical.

D. H. Heywood, American Fork, Utah, has for some time been using a Hughes electric oven in his bakery. The following is his report of his baking and cost of operation for July, 1915:

10,000 loaves of bread.
260 dozen rolls.
312 layer cakes.
600 dozen small cakes.
130 jelly rolls.

The cost of electric power during the month was $12.00.

Motor Driving High-Speed Friction Saw.



Motor-Operated Heavy Bar Shear.

Commercial Practice
Management, Rates, New Business

SHALL THE CENTRAL STATION SELL APPLIANCES?

By J. H. Moseley.

This question, which has been uppermost in the minds of central-station managers for several years, is still in the limelight and although some companies have made decisions in the affirmative and are now conducting appliance shops, others who are on the verge of this move are proceeding cautiously and are hesitating to plunge their company into a policy which may develop into an unwise one.

There are three divisions of central stations in the United States which should be considered in attempting to arrive at an answer to this question.

First, there is the central station in the small town (meaning towns of possibly 3,000 to 5,000 population or under) in which there is necessarily not enough new building going on to justify the existence of a regular contracting business. In towns this size electric wiring is either done by the electric company through necessity or is turned over to some young fellow who has his office on the street and keeps his tools in a bag at his home. This young fellow who does the work primarily through a matter of interest or desire to pick up a few odd dollars has no place to merchandise appliances, and merchandising is the word to use, and if the electric company desires to place such appliances on its service lines it must sell them itself or leave the matter to the local hardware or drug store. These two classes of stores are the ones which naturally drift into this class of business. While there are a great number of companies which will fall into this class, the percentage which have managers aggressive enough to push for the appliance business are so small that this division will not be considered.

Second, there are the central-station companies in towns of from 3,000 or 5,000 to possibly 50,000 population. A real live contractor can make a nice living in a town of 5,000 population, but such a person has a tendency to outgrow a place of this size and leave his business to some other person who is less competent to handle it. In towns and cities of more than 5,000 population there are usually two or more contractors who do wiring and sell appliances. These men are primarily contractors and have made no study whatever of the merchandising game. They are usually so eager to get wiring jobs that price-cutting is a favorite pastime and it is only a short time until the original capital put into the business has disappeared. This is due partly to poor cost systems and also to ideas that a competitor may be "frozen out" so to speak. The net result is that the next man who comes in suffers from the methods employed by his predecessors. In the meantime the appliance business has not been pushed and the central station is the loser as well as the contractor.

What should the central station do in a case like this?

Advertisement of Central-Station Company.

FOR TWO WEEKS ONLY
This Western Electric RITE-HEAT Iron (Guaranteed) is just what you have been looking for. Must be seen to be appreciated. And just think of the price—this week and next—this iron and the Western Electric LEKTRIK Stove shown below
2 FOR $5.00
Each of the Fireless Appliances GUARANTEED
This Western Electric TRIANGLE stove will do your work at a moment's notice. Quick and convenient. This week and next, Rite-Heat Iron and Electric Stove
This Western Electric Triangle stove will FRY, BROIL, BOIL and TOAST.
$5 for the Two
KEEP COOL
Why cook over a hot stove?
Temple Electric Company

Supplementary Advertisement of Local Dealer.

One thing which can be done is to educate the contractor out of the price-cutting idea and at the same time try to teach him something of the merchandising idea. All persons realize that men go into business for a profit and every fair-minded person is willing to allow the business man a reasonable profit on the service rendered him whether it be in the purchase of an iron or a house or building wiring contract. Once the contractors have been educated to this fact and to the fact that they should share in the available business and obtain it at a reasonable profit, it is not such a hard matter to then get them interested in making more money by pushing electric appliances. This sounds very easy, but the actual

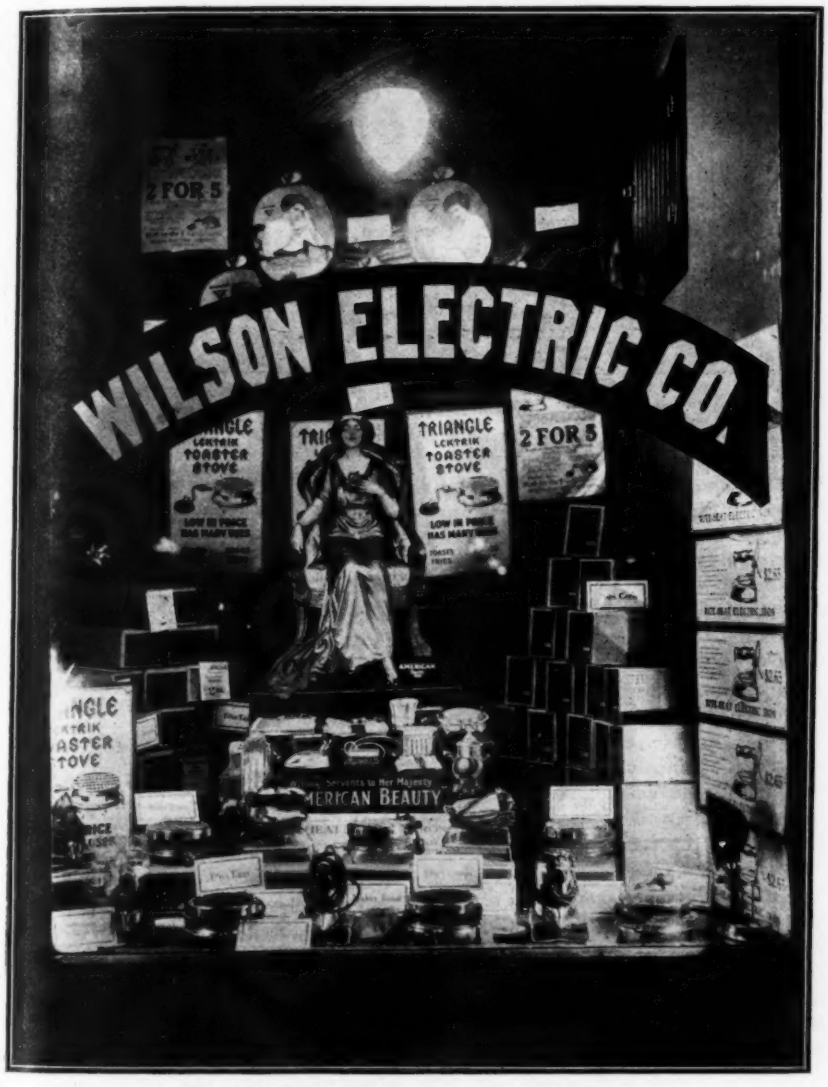
accomplishment of such a policy is a great deal harder to bring about.

As an example of such a policy it might be well to mention an appliance campaign which was recently put on by one of the large manufacturers of heating devices in a number of towns where electrical properties are operated by the Texas Power & Light Company. When this company began operations in Texas it was decided that the appliance business together with the electrical contracting business properly belonged to the local electrical contractors. Stocks of appliances which had been taken over with small properties were turned over to the local contractors at less than cost price and the educational campaign was started. At the present time this policy has been in effect over three years and the results obtained from the campaign mentioned give a fair idea of its success.

The company co-operated with the manufacturer and the local contractors in 21 towns varying in population from 750 to 42,000.

The special offer consisted of a guaranteed electric iron and a toaster stove for $5. While the fact was not advertised the regular price of the iron was only $2.65 and the toaster stove $2.75, which really made no very great bargain. However interest was created by using the slogan "2 for 5" throughout the campaign and to this one fact is attributed the greater part of the results obtained. While this slogan was used to get the people to the stores the policy was not rigidly adhered to and quite a few irons and stoves were sold separately at the regular price, these being included in the figures given. In addition to these figures, however, a number of percolators and appliances of other manufacture were sold during the period, showing that the stimulating effect of the campaign was good.

The campaign was held during the first two weeks in August. An enclosure was used in all customers' bills. This "teaser" was designed to excite curiosity. Approximate 20,000 were sent out.



Show Window of Dealers' Store During Campaign.

Every dealer who participated in the campaign was furnished a window display and these were made use of in practically every case. A typical display is shown in one of the accompanying illustrations.

On the second day after the enclosures had been sent out the first newspaper ad appeared. This, as illustrated, was in the form of a notification that the "2 for 5" had arrived. Attention was called to the fact that these appliances could be obtained "at your electrical contractors." On the same day handbills were distributed in the towns by the contractors. These were of assorted colors and attracted considerable attention. On the fifth day a four column ten-inch newspaper ad was used, and this was followed up five days later by a two column ten-inch ad.

Space was used in 31 papers whose rates varied from 7.5 to 35 cents per inch.

Contractors in four towns out of the 21 pushed the campaign still more by using newspaper space on their own account. One of these used an amount of space equal to that used by the company and used this on the same days, so that double attention was called to the campaign.

All contractors were supplied by the jobber with a canvas sign four by six feet reading "FIRE-less SALE, 2 for 5, Aug. 3-14."

Town	Population	Irons	Stoves
Waco	42,000	15	8
Taylor	7,000	7	6
Temple	13,500	13	12
Brownwood	10,000	12	12
Bonham	7,000	10	8
Honey Grove	2,500	8	6
Roxton	750	9	10
Denison	18,000	26	16
Paris	13,500	20	11
Sherman	17,000	27	17
Van Alstyne	1,500	18	12
Commerce	3,000	6	3
Plano	1,300	5	6
Cleburne	14,000	13	9
Ennis	6,700	6	4
Hillsboro	8,000	6	5
Waxahachie	7,650	2	2
Gainesville	10,000	12	12
Wichita Falls	15,000	13	11
Palestine	13,500	18	16
Tyler	13,000	14	9
Total		260	195
Total both			455

Altogether 455 pieces were sold amounting to an estimated annual revenue to the central station of $2,275. The total expense to the company for newspaper advertising was $215.50. The bill enclosures and handbills were furnished by the manufacturer, and outside of the labor of enclosing the "2 for 5" fliers in the bills and getting up the newspaper ads no expense other than newspaper advertising was incurred. Hence the total expense of the campaign to the company was approximately 9.5 per cent of the estimated annual revenue, which, considering the character of the load and the time of the year in which the campaign was

held is as low as could be expected.

With the exception of some few isolated cases it may be said that such campaigns are necessary occasionally in this particular locality, to keep the dealers interested in the appliance business.

One fact is noticeable in the majority of cases observed, and that is the lack of finances on the part of the dealer or contractor. Few are able to discount their bills and thus obtain the lowest prices on their stocks. On this account many of them order in such small quantities that when price and express or freight are considered they have a very small margin left for selling expense and practically none for profit.

An objection to the handling of appliances by central stations in towns

2 for 5
For Two Weeks Only
The Western-Electric BITE HEAT Iron (Guaranteed) is just what you have been looking for. Must be seen to be appreciated. And just think of the price—this week and next—this iron and the Western-Electric LEKTRIK Stove.
Each of these Fireless Appliances
GUARANTEED
—See Them In Our Show Window—
Bonham Electric Supply Co.
Bonham, Texas Phone 500
OFFICE WITH TEXAS POWER & LIGHT COMPANY

Newspaper Advertisement of Dealer.

of 10,000 to 15,000 population is the fact that the business is hardly large enough to justify the employment of a special man for this work. The ordinary clerk in such an office is not a salesman, and in most cases will be busiest at the very time the opportunity is offered to interest the customer in an appliance (that is when he comes to the office to pay his bill).

In the case of a company similar to that above mentioned, appliances might be handled by placing a small show case in each office and keeping therein a standard stock of appliances. By standard stock is meant those appliances which the public has been educated to use. One or more special men could be employed to go from town to town and hold introductory sales, a new appliance being offered each time. During this period of say one or two weeks slight reductions for cash could be offered on other standard appliances. In this way the office force could gradually be educated to the merchandising idea. If two special introductory sales were conducted each year, and if during the two weeks before Christmas special efforts were made in all branches of the company there is little doubt that in a few years the customers would be familiar with almost every type of appliance.

In order to compensate for the average clerk's lack of ability it would no doubt be a good idea to make a practice of selling all appliances for a small cash payment, the balance to be paid in monthly installments with the electric bill. The company would have on its books a good indication of the customer's ability to pay and would thus be able to avoid losses due to bad bills which a contractor or dealer might incur.

In lieu of either of the plans referred to a co-operative plan similar to the last one mentioned might be employed with profit to the contractor or dealer and the central station.

The general idea under this system would be to permit the contractor or contractors to furnish a neat show case to be placed in the company's office. The contractors would furnish a stock for this show case, the nature and quantity of the stock to be decided by the company. This stock might consist of three or four styles of irons, two styles of toasters, one style of chafing dish, one style of percolator, etc., as the size of the town and the variety of stocks handled by the dealers might dictate. Each contractor would furnish tags for his appliances with a space left for the name of the appliance and the price at which sold. This tag could have one end perforated so that the company could keep a record of all sales made. If a customer came in and wanted a certain make of iron and both contractors sold this make iron the sale would be made by the contractor who happened to have that style of iron on exhibit. As soon as this iron was sold the clerk could telephone the other contractor to send over an iron like this, and put it on display. Thus the next purchaser who bought this make of iron would buy from the second contractor. In this way the business could be conducted without showing any favoritism.

As to division of profits it is probable that the company could afford to operate under this plan for 50 per cent of the gross profit on any article, with an understanding that an allowance of 5 per cent of the retail price be allowed by the contractor if an appliance were sold on terms.

Under such a plan the company could have its special man or men to go to the different towns and arrange window displays and special introductory sales. On these special sales the appliance introduced would be sold at the contractor's cost price, the company handling the sale without charge, no terms being offered at the special price.

One of the biggest objections to a plan of this kind would be that the clerk or clerks, even though they were strictly neutral, so to speak, might be sooner or later suspected of favoritism by some suspicious contractor or dealer.

Again, under such a plan what policy would the company pursue toward hardware stores or drug stores which were selling appliances?

Would these stores be allowed to display their wares at the company's office under the same conditions? I hardly think this would be necessary.

Newspaper Advertisement of Contractor.

An aggressive company, operating in only one town, might also be able to employ this same plan profitably.

Really the only way the success of such a system could be determined would be to try it. Does it not sound plausible, however, as a possible answer which might be satisfactory to all concerned?

Going from the medium size city of 50,000 let's take the third class, the cities having more than this population.

Here is a place where the establishment of an entirely separate "Electric Shop" selling nothing but electrical appliances is justified. Such a plan as that outlined might even be used in cities this size, and if proper co-operation could be obtained there seems little doubt that the collective publicity campaigns of a large central station and a half dozen or more contractors would be more effective than that of the central-station company alone or

of one contractor or electric shop alone.

Here is the place where the business should be organized as a separate department and operated as such for a profit. The main point of issue in such a case seems to be a matter of policy. That is, shall the central station, whose main object is selling service, go into the merchandising business?

Power engineers argue that it is foolish for a manufacturer to try to make his own power, as his time should be devoted to manufacturing his product which he sells. They say that the central station is a specialist in the manufacture of power, and hence can afford to offer this power, and in addition, certain services at a cost which will make it profitable for the manufacturer to purchase from them.

Do we not back up on this argument when we propose to go into the merchandising business instead of sticking to our main business of selling service?

Or is the sale and introduction of electric appliances a duty of the central-station company?

Advertisements That Sold Many Irons.

The value of newspaper advertising was convincingly demonstrated in a recent iron campaign conducted by the Empire District Electric Company serving Joplin and Webb City, Mo., and Galena, Kas. The company offered a

THIS WAS IRONING DAY!

Now that it is All-Over, the Unpleasant Experience fresh in your memory, if the operation was performed with an Iron other than an Electric One, we want to let this "Way of Wipe" enter your life and tell you something that the Teacher left out of the "Course of Study."

Much of the same difficulty is experienced today in using the ordinary Sad Iron as in the day they Pushed a Hot Rock over the Fig Leaf. The iron is too hot at the beginning of the operation and too cold before it is replaced on the stove. Time is lost in this besides that wasted in running over the Beeswax, the Sand Paper, the Cleaning Cloth. To make speed one has to to do their work near the Stove. Pleasant tho't—A Stove!

Now in Electric Ironing the operation is continuous, it is cool because it can be done in any part of the house or on the porch—all the heat is supplied to the smoothing surface of the iron—Uniform—Steadily Applied—The handle is cool, it is FIRMLY fixed to the iron. You can regulate the temperature for any kind of work.

The nature of Women's Summer Apparel is such that it requires great care in the Ironing—so we've been told—care that the Maid won't give and hence Madam prefers to do it herself, but few women will brave the Heat of the Kitchen even for appearance sake.

There is no reason for the existence of the SAD IRON so join the Bunch that is to eliminate the "Kill Joy" on next Saturday. You will find Saturday a better time than any day during the balance of the year.

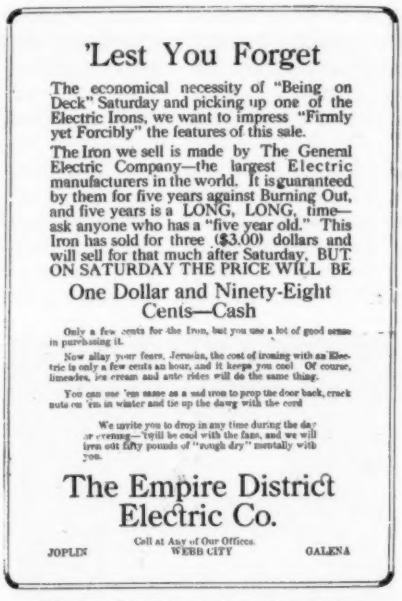
THE EMPIRE DISTRICT ELECTRIC COMPANY

First Advertisement in Campaign.

$3.00 General Electric flat iron for $1.98, the sale being limited to one day only. Newspaper advertising was relied upon entirely in the campaign, a series of advertisements being published, one each day for an entire week. Several hundred irons were disposed of as a result of the company's activities. The accompanying illustrations show three of the advertisements. As will be noted, the copy is cleverly written and particularly appropriate.

Reduced Rates in Pepperell.

The town of Pepperell, Mass., has voted to sell its street-lighting equipment to the Shirley Electric Company, Chirley, Mass., and to purchase energy for public lighting from that company


'Lest You Forget

The economical necessity of "Being on Deck" Saturday and picking up one of the Electric Irons, we want to impress "Firmly yet Forcibly" the features of this sale.

The Iron we sell is made by The General Electric Company—the largest Electric manufacturers in the world. It is guaranteed by them for five years against Burning Out, and five years is a LONG, LONG, time—ask anyone who has a "five year old." This Iron has sold for three ($3.00) dollars and will sell for that much after Saturday, BUT ON SATURDAY THE PRICE WILL BE

One Dollar and Ninety-Eight Cents—Cash

Only a few cents for the Iron, but you use a lot of good sense in purchasing it.

Now allay your fears, Jerusha, the cost of ironing with an Electric is only a few cents an hour, and it keeps you cool. Of course, limeades, ice cream and auto rides will do the same thing.

You can use 'em same as a sad iron to prop the door back, crack nuts on 'em in winter and tie up the dawg with the cord.

We invite you to drop in any time during the day or evening—you'll be cool with the fans, and we will iron out fifty pounds of "rough dry" mentally with you.

The Empire District Electric Co.

Call at Any of Our Offices.
JOPLIN WEBB CITY GALENA

Final Advertisement in Campaign.

at 10 cents per kilowatt-hour. Commercial lighting will be at the rate of 12 cents, and power 12 cents for the first 100 kilowatt-hours a month, 5 cents for the next 400, 3 cents for the next 1,000, and 2 cents for all over 1,500 kilowatt-hours a month.

Heretofore, the public and private energy supply has been a local paper mill plant, but the paper company wished to discontinue the sale of electricity, and to buy from a distinctly lighting company. The rate heretofore has been 11 cents for street lighting, 15.5 cents for commercial light and power, and free lighting of the public library. The yearly cost for each of the 40-watt street lights operating on a moonlight schedule, has been $17.97, but under the new plan the cost to the town will be $11.75, the maintenance of poles and wires being borne by the company.

Problem of Free Lamp Renewals in Boston.

Under the Boston Edison Company's free lamp renewal practice new incandescent lamps are supplied in exchange for old lamps returned when burnt out or noticeably dim. It is intended that all lamps shall be returned with whole bulbs. Many companies refuse to accept or credit broken lamps, but the Boston Edison Company has made it a rule to limit stubs received to 20 per cent of the whole number, but has made exceptions in extenuating circumstances.

The rapid increase of Mazda installations, and the extension of the free exchange privilege to lamps of larger sizes, have resulted in the breakage item becoming a serious matter to the company. Lately, the lamp division has adhered strictly to the 20-per-cent rule, counting all stubs above that amount as "lost." The company in applying the rule with strictness, points out that breakage includes new as well as old lamps, and that many of those destroyed burned only a small part of their intended life. The result to the company is not only an economic loss, but also an unwarranted expense in supplying new lamps. It is properly argued that carelessness on the part of the customer should not be a burden on the lighting company, especially when lamps are supplied as liberally as the Boston Edison Company supplies them.

City Map Used for Street-Lighting Chart.

To denote the location of street lights in graphic fashion the lighting company of New Bedford, Mass., has, on the wall of the electrical superintendent's office a plan of the city, indicating streets in detail, 12 feet 6 inches long by 4 feet high, this being a copy of a blue print and on a scale of one inch to 400 feet. Pins 0.5 inch long with colored cloth tops, are placed in the map, which is mounted on a heavy

Stumble over the Baby, step on the Kat's tail, trip over the family Ford, but lug that six pound SAD IRON into the Front Room to do the ironing that you may get away from the sweiter of the Kitchen Stove used to heat it.

But you get there, the iron is still hot—still Sad and merrily you iron for three or four minutes—then the Marathon again via: Ford, Baby and the Kat.

Now we never did any ironing but in order to know of what it consisted we got out the Family Medical Advisor and found that it was an operation that took place on Wednesdays. Mother gets up at Five O'clock to get started before the "heat of the day" invariably mother beat the day to it and got "Hot Up" first. The dinner father got at noon didn't look half so bad as Mother.

All of this has to do with an Electric Iron of which we will speak of at length from now on until next Saturday, after which we will forever hold our peace.

THE EMPIRE DISTRICT ELECTRIC COMPANY

One of a Series Run During the Week.

cardboard back and framed in oak, to indicate the exact location of each lamp, the various colors representing lighting units of the several types installed. White represents 100-candlepower tungstens; orange, 250-candlepower tungstens; blue, series inclosed arcs; brown, multiple inclosed arcs; red-and-black check, series flame arcs; red, multiple flame arcs; black and white check, Washington arcs; green, magnetite arcs.

Electric Irrigation Proposed for Cape Cod District.

The territory of companies owned by the Boston Electric Association, viz., the Buzzards Bay Electric Company, the Martha's Vineyard Street Railway Company, the Vineyard Lighting Company and the Vineyard Haven Gas & Electric Company, comprises upwards of 400 square miles of Cape Cod and Martha's Vineyard Island, Mass.

Power on the Cape is furnished from a power station in Falmouth, from which transmission lines extend north 23 miles to Sandwich, on the Cape Cod Canal, and east 24 miles to the important summer resort of Hyannis. The intermediate territory served is dotted with towns filled with handsome summer homes, and the permanent population devotes its energies largely to fishing. The canal itself is lighted with electricity furnished by the Buzzard's Bay Company, and the demand for electric power for fish freezing in the coast towns is reaching large proportions.

The latent possibilities of the cheap Cape lands for agricultural purposes, especially when developed through irrigation, has been recognized by Eugene Carpenter, the enterprising executive of the allied companies. Mr. Carpenter believes that with the aid of electric power pumping water for irrigating, much of the soil now neglected will yield abundant returns to the agriculturist. With this end in view, he is soon to go to Utah, where he will make a study of the effective co-operative irrigation methods.

The amalgamation of several scattered lighting and traction properties into a successful system is a noteworthy achievement for which Mr. Carpenter is in large measure responsible.

Operating Cost of a Five-Ton Electric Vehicle.

Actual cost data for operating a one-ton truck in service of a New England central station for the past five years on line construction, have been formulated as follows: Original cost, $2.650.

	5 years	1 year	Per Mile
Miles traveled.....	26,620	5,324	.....
Kilowatt-hours used	22,990	.....	0.864
Current cost, at 3.5 cents.....$	804.65	160.93	0.0302
General repairs and painting....	372.23	74.44	0.0140
Battery renewals and repairs.....	1,034.00	206.80	0.0388
Tires	522.83	104.56	0.0197
	$2,733.71	$546.73	0.1027

The truck is today in excellent condition mechanically and runs as economically in current cost as the year it was bought. It has been in constant daily use, in all kinds of weather.

SUCCESSFUL COMMERCIAL MANAGERS.

A. C. Martin.

Everyone in the electrical business knows of the progressiveness and success of the Rockford (Ill.) Electric Company. In fact, this company was a pioneer in the adoption of methods and policies that have since become standard for all modern utilities. Frank H. Golding, now manager of the Atlantic City central station, is largely responsible for the high standing of the company for it was during his term of office as manager that the foundation was laid for the present successes. Mr. Golding, among his other qualifications, had the happy faculty of choosing as his co-workers men who soon came to admire and respect his methods and had the ability to adopt them and when he left Rockford it was with the satisfying knowledge that his work would be carried on without interruption.

A. C. Martin,
Commercial Manager, Rockford Electric Company.

A. C. Martin, commercial manager of the Rockford Electric Company, is one of Mr. Golding's proteges. He has established the Rockford company as one of the first in the country in connected horsepower per capita and this in spite of the fact that a large share of the available power business in the city was woodworking plants.

Mr. Martin had the advantage of receiving an education at the United States Naval Academy, Annapolis, Md., and on resigning from the navy, went to Pittsburgh, first entering the employ of Carnegie Steel Company, at Homestead, and then joining the force of the Westinghouse Machine Company, going through a course in the turbine department, and later becoming erecter of turbines in the southern district.

On leaving this company, he entered the operating field and operated a turbine plant for a land company in Texas, later he became chief engineer of the Sheffield Electric Company, having a power house, operating city water works, city railway and city light and power. After working in the engineering end of the business for three years, he came to the Rockford Electric Company as power engineer in 1910. In 1912 he was made commercial manager of the company and has held that position ever since.

In speaking of his policies, Mr. Martin says: "My policy and principles have always been service to the company, and I believe in this way the public also benefits. For if one gives his entire time, thought and study for the interest of the company, it cannot help but make the company stand well in the public's eye.

"In handling our men we always put the entire responsibility of their territory to them, and never attempt to make a sale where one of them has failed. We believe this has made better men of them, and also believe they appreciate it, as we lose very little business, and when we do lose it, it is only temporarily.

"We have always studied the other fellow's game, very closely, and are trying to adapt merchandising schemes to our own business. Of late we have been working towards the further co-operation of the electrical contractors of the town, and believe that if we all work as one family, it must mean more business for the central station.

"Our methods of advertising have always been to obtain direct results, rather than trying to mold public sentiment. For instance, when we are after house wiring, we advertise for house wiring prospects, and the same method is used for other things."

Ozark Company Secures Large Contract.

The Ozark Water & Power Company has opened offices in the Landers Building, Springfield, Mo., having moved the headquarters of the company from Joplin. C. E. White, vice-president and general manager, is beginning an aggressive campaign for contracts to supply current from the company's hydroelectric plant to the towns of the section, and has recently made such a contract with the Lawrence County Light & Cold Storage Company of Aurora, covering a period of 15 years.

Electrical Construction

Examinations of Electricians Held in Massachusetts.

Results of the examinations of employing electricians and journeymen electrical workers in Massachusetts are being formulated by Clerk Dallas of the Examining Board. Of the 450 who took the examination on August 11 about 50 failed to pass. The 147 candidates for certificates in both classes who took the examination of August 25 made better marks, because of the clearer phraseology of the questions requiring answers. Of the 147, 130 men qualified.

A third examination was held in Boston on September 1, when about 100 presented themselves. Of these a number were men who had failed to pass a previous examination, the law giving a second opportunity to meet the required test.

To date 650 Class A certificates have been issued to employing electrical contractors, under the provision which exempts experienced men of five years' experience from the necessity of taking an examination, and also to employers who passed the Class A test. About 4,500 certificates have been issued to journeymen, of which about 500 are the result of successful examination, and 4,000 under the five-years' experience exemption.

Fees for Wiring Permits in Boston.

The following schedule of fees to be charged in connection with the granting of permits by the Wire Department of the City of Boston, authorized by special act of the Legislature of 1915, and effective October 1, has been approved by the Mayor, as submitted by Wire Commissioner Cole:

For installations of incandescent lamps: 1 to 5 50-watt lamps or equivalent, 75 cents; 6 to 10, $1; 11 to 15, $1.25; 16 to 20, $1.50; increasing in steps of 25 cents for each additional 10 units until 100 units is reached, for which the prescribed fee is $3.50. Above 100, for each 25 50-watt lamps or equivalent, 25 cents shall be added.

For fixtures, 10 (or less) 50-watt lamps or equivalent shall require a fee of 75 cents, and each additional 50 units in excess of 10, 25 cents.

For service connections, with converters, the fee shall be 50 cents; for generators of 25-kilowatt capacity or less, $1.50; and for over 25 kilowatts, $2 for each permit.

Permits for temporary work shall be charged for at the rate of one-third of that for permanent construction.

For motion-picture machines, stereopticons or similar apparatus, the fee for permits shall be $1 each. Duplicate permits or certificates will cost 50 cents.

Each 50-watt incandescent lamp, or one of less capacity, except sign lights, shall be rated as one unit. Sign lamps shall be reckoned at actual rating. Arc and mercury-vapor lamps shall each be rated as ten 50-watt lamps. Heating devices shall be rated as two 50-watt incandescent lamps for each ampere or 100-watts capacity.

All motors are to be rated on the basis of ten 50-watt lamps to each horsepower, but charge for simple motors of 25 horsepower or over is not to exceed $5.

Where the number of lamps to be connected to wiring is unknown, each circuit shall be charged for on the basis of 12 lamps per circuit.

The fee for electrical equipment not listed above shall be 75 cents, to cover one inspection. Subsequent inspections, 75 cents an hour, with a minimum of 50 cents.

Among the Contractors.

The Bland Electric Company, Louisville, Ky., has the contract for the electric wiring in the new mercantile building of the Speed estate, which is being erected on Fourth Avenue in Louisville at a cost of several hundred thousand dollars. The contract is one of the largest placed in the city.

The Empire Electric Construction Company, Louisville, Ky., has a contract for the installation of 70 lights for W. Heller at 303 Peterson Avenue, Louisville. This is one of the biggest residence jobs of the season, the work amounting to $300.

The Childers & Waters Company, of Louisville, was awarded the contract for handling all of the electrical work at the Kentucky State Fair in Louisville, September 13-18, for the fifth successive time. The contractors will have entire charge of electrical installations, all varieties of lights being provided, as well as motors for special purposes. The job is a hurry-up proposition, and a crew of five to ten men is kept on the work all during the fair, as well as for several days before and after.

J. R. McCutchan of Kenosha, Wis., has sold his interest in the firm of the Rockwell McCutchan Lighting Fixture Company, and has entered the electrical contracting business at 229 Marion Avenue, Kenosha. He would like to be supplied with catalogs and price-lists by the manufacturers of fixtures and lighting appliances.

The Avery-Loeb Electric Company has received the contract for special street illumination for the Columbus, O., fall festival, September 15-16. This will be confined to a stretch of street 600 feet long, in which 3,500 small lamps and seven of 1,000 candlepower are to be used, largely in overhead festoon effects. This Columbus company has also been successful bidder on three high schools, at Cedarville, Milford Center and Orange Township, which will average $1,500 each. It will likewise do the wiring for booth illumination incident to two national conventions to be held in Columbus in September, one by the stationary engineers and one by the bakers.

Recent contracts secured by the Sacket Mine Supply Company, Columbus, O., include rewiring of the building occupied by the national headquarters of the United Commercial Travelers, Columbus, a $1,200 job; the rebuilding of the 150-horsepower synchronous motors at the Crooksville mine of the Zanesville Coal Company, which were recently destroyed by lightning, and the motor equipment of the Dunlap Manufacturing Company, Columbus.

The Electro-Mechanical Company was awarded the contract for the electrical installation of the Ward Baking Company plant on Hanover Street, Baltimore, Md. The equipment includes a charging plant for the electric motor trucks operated by the Ward Company. This is one of the only industrial companies in Baltimore operating electric trucks.

Wiring and Conduit Work at the Panama-Pacific Exposition.—III.

By A. A. Willoughby, Pacific Coast Correspondent.

Installation of Conduit System.

When the condition of the grounds became sufficiently advanced to warrant the installation of the underground conduit system, the Exposition engineers took bids and two contracts were let for this work, following the established policy of letting all work by contract.

The first contract let covered the system in the State and Foreign district and embraced the laying of approximately 36,000 duct-feet of three-inch Linaduct and 46,000 duct-feet of two-inch duct, including 38 wooden manholes. The unit contract prices for additions to or deductions from the amount specified in the contract were as follows:

No. of Section	Ducts per Section 3-inch	2-inch	Costs per Trench-feet
1	6	12	$1.32
2	4	6	0.84
3	4	5	0.785
4	4	3	0.675
5	3	6	0.78
6	3	5	0.725
7	3	3	0.615

The second contract let covered the installation of approximately 221,000 duct-feet of three-inch Linaduct. The major portion of the system was wooden sandbox construction and wooden manholes, the latter numbering approximately 100. The main trunk-line section, amounting to approximately 39,600 duct-feet, was laid in concrete. Wooden manholes, however, were used in the latter section. The number of ducts per box section varied from 4 to 21 under this contract and the unit prices for additions to and deductions from this contract were as follows:

No. of Ducts	Cents per Duct-foot
21	8.1
18	8.1
15	9.28
12	9.28
10	9.28
8	11.42
6	11.42
4	11.42

The wooden manholes were made in various sizes, contract prices ranging from $36 to $65 in place.

Before the work on the second contract was half completed, the contractor became involved in financial difficulties and the Exposition had to take over the completion of the contract under a financial arrangement with the contractor's bondholders, who assumed all liabilities. The actual cost records of the Exposition's portion of the work and an analysis of the contractor's costs showed that the work actually cost 25 per cent more than the unit prices allowed in the contract. The principal reason for the additional cost of this work above the contractor's estimates was the fact that general construction activities were everywhere so prevalent that it was impossible to carry on the work of laying the conduit consecutively and interruptions were continually occurring.

No engineering difficulties were experienced in building the boxes or laying the conduit and the chief anxiety of the engineers lest sand would find its way into the conduit, never gave cause for trouble because in the actual installation of the cable system, no sand was in evidence. A mandrel was pulled through every duct after its installation before the work was passed by the inspectors and the ducts were immediately plugged at both manhole ends with wooden plugs to prevent scummy water from entering the ducts during the idle period. One advantage of this type of duct system, developed during the process of installation where in a few minor cases the duct was broken into by contractors working on sewer and water connections, was the ease with which repairs could be made, it being a very simple matter to remove the wooden covers, take out the sand and duct at point of breakage and make repairs.

The minor secondary laterals and underground distribution about the grounds was handled by means of a cheap wooden pump log made up in a molding machine, in two sections in lengths varying from 6 to 14 feet. The sections were bonded together every foot by wire staples, coated on their points with a strongly adhesive solution which preserved the bond between staple and wood as the stock dried out. This conduit was made from untreated fir but with standard socket joints similar to pump log. It was made principally 2.5 inches in inside measurement, which allowed it to be made from standard 2 by 4 or 4 by 4 stock. Where necessary it was also made with a three-inch bore. This conduit was secured for about one-half the cost of standard pump log and due to its extra length, made up much more rapidly in the field. Under the temporary conditions obtaining at the Exposition, its use was very satisfactory and economical.

Fig. 8.—Close View of 18-Inch Duct Section Showing Three Layers of Conduit.

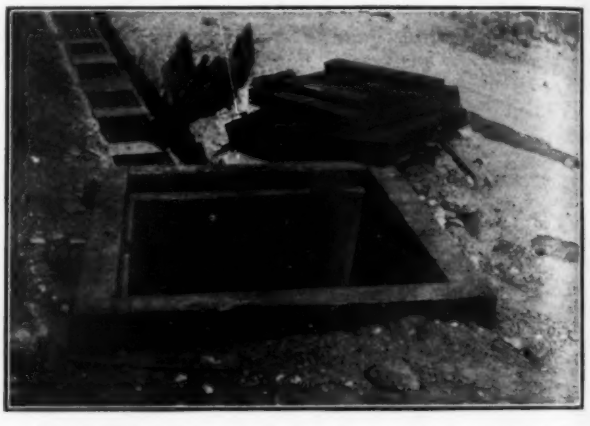


Fig. 9.—Close View of Shallow-Section Manhole Showing Construction Details.

Installation of Cable.

When the time came for installing the cable in the completed duct line, the most serious consideration had to be given to the method of pulling in the cable, due to a clause in the contract between the Exposition Company and the Pacific Gas & Electric Company on the rental of cable and apparatus. This clause reads as follows:

"All cables having the lead sheath scored to a depth in excess of one-third the thickness of the sheath, and all cables that have been flattened or dented so that the minimum diameter

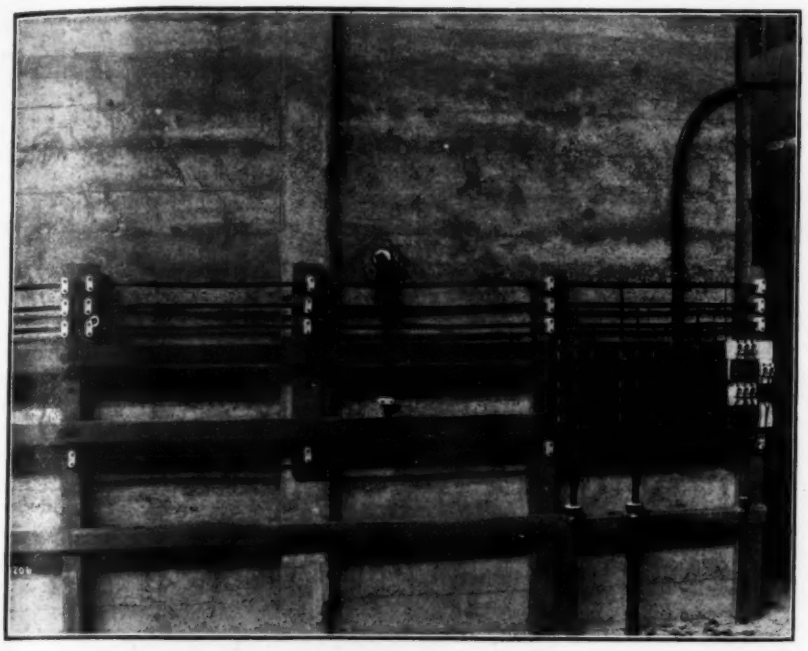


Fig. 10.—Typical Distribution Rack.

is less than 0.8 of the average diameter of the cable, shall have the defects cut out before the cable is measured and reeled as herein provided."

This clause, together with another proviso in the contract which made 300 feet the minimum returnable length, made the question of handling the cable one for serious consideration, both in installing and in the future operations of taking it out.

In order to take no chances of scoring the lead sheath, especially under these conditions where so much sand had been used in the conduit structure, it was decided to pull the cables very slowly. A winch was designed having a 4.5-horsepower gasoline engine with belt drive, which hauled the cable at a speed not exceeding 20 feet per minute. The winch was of a standard pattern used by the Pacific Gas & Electric Company, the prime mover and the operating speeds being the principal points of difference. The gasoline engine proved very satisfactory under the conditions, especially as electricity was not available at all points on the grounds at that period. The unusually slow speed employed required less power in pulling, gave the men at the reel more time in carefully entering the cable in the conduit, and allowed of the cable brushing aside minor obstructions in the duct and avoiding to a considerable degree the possibility of the sheath being cut or stretched as at a higher pulling speed. While the cost

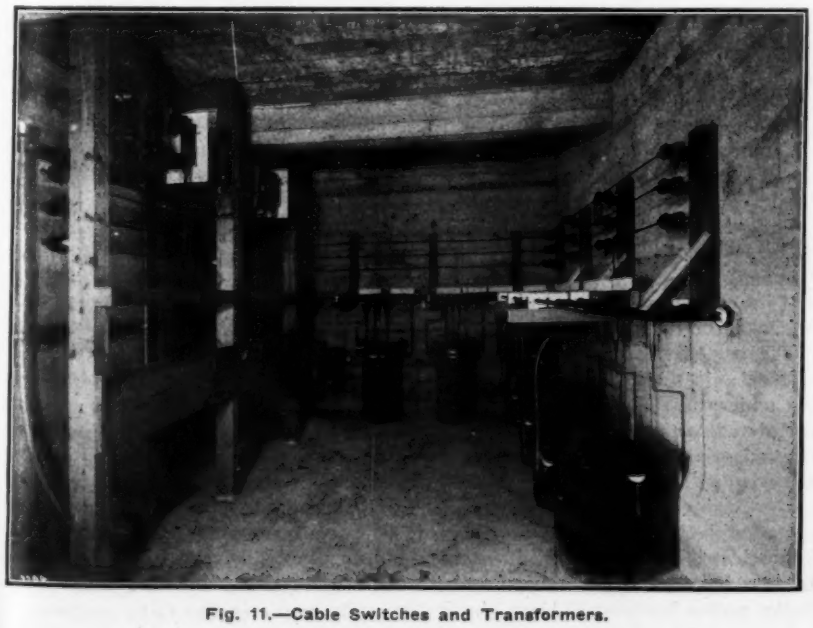


Fig. 11.—Cable Switches and Transformers.

was naturally higher than at ordinary speeds of pulling cable, the portion of the time employed in actually pulling was secondary to the time required in the preparatory work of setting up the winch and pulling tackle, and the results as far as the condition of the cable was concerned, were most gratifying. Numerous instances where the cables were pulled through an intermediate manhole gave ample chance for inspection of the lead sheath and in no observed case was there the slightest sign of the sheath being damaged.

Carrying out the idea of carefully safeguarding this cable, the Exposition naturally handled the work of installation with its own men. Cable-pulling equipment was purchased outright and costs were kept on pulling and splicing throughout the main portion of the work. The costs were as follows:

The average costs per splice on 4.0 three-conductor primary cables was $5.80 for labor and $9.50 for material, a total cost of $15.30 per splice.

The average labor cost for pulling in primary cable was 3.7 cents per foot. The investment in cable-pulling equipment, less 25 per cent salvage value, when charged against the amount of primary cable pulled, adds 1.1 cents per foot, making a total pulling cost of 4.8 cents per foot.

These figures are based on actual costs kept on the installation of 94,000 feet of primary cable in the main network.

While these costs are not as low as could have been obtained on standard city distribution, they are reasonable when the conditions of pulling are considered. As stated in a previous section of this article, the majority of the conduit was in terraced lawn, which made it necessary to build special cribbing to get the reels in place and the winch had to be placed on the adjacent roads, the hauling line being pulled around a special swivel sheave built into an appropriate framework designed for these conditions. Of course the very slow speed at which the cable was pulled in added appreciably to the cost.

The splicing was all done with formed paper tubes and the racking was handled by means of simple iron pins driven into the timber uprights of the manholes, the cable resting on a saddle of wooden pump log that was straddled on these pins. This proved a very cheap and, under these conditions, a very efficient method of racking. The terminals of the cable, which were fastened to a wooden framework in the transformer vaults, were insulated and weatherproofed by means of tin funnels built similar to a pothead and fastened to the lead sheath by means of binding wire and a few layers of tape to prevent the running out

of the compound. Paraffin was used for filling these funnels instead of the standard and more expensive insulating compound. These terminals have proved entirely satisfactory in operation and were installed at a nominal cost.

Primary cable-junction boxes were installed on the cables feeding the State and Foreign Section wherever a primary tap was to be taken to the transformer vaults in the larger pavilions in this section. These boxes are octagonal in shape and had section links installed to permit sections of cable to be rapidly disconnected in case of trouble.

Installation of Transformer Vaults.

The installation of the transformer vaults was made as simple as possible by the laying-out as previously mentioned of a plain and uniform cantilever framework of wood, the vertical member of this framework being bolted to the concrete wall of the vault and the horizontal member being stayed to the vertical member by means of two standard cross-arm braces. The material for all of these vaults, approximately 50 in number, was ordered at one time, together with a stock of cross-arm bolts and braces, and the only modifications in the field were the number of sections used to accommodate the size of the transformer installation. The buses in each case were made of sufficient length to accommodate future transformers where required. The switch equipment used in the vaults consists of different types and capacities of hand-controlled oil switches, including a number of pole-type line-control switches, shown in Fig. 11. This was done to accommodate future absorption by the power company leasing the equipment.

The secondary distribution was handled on wooden racks of standard arrangement, varying only as to length and quantity of switches to be accommodated. (See Fig. 10.) These racks were fastened to the outer walls of the transformer vaults, where they projected into the building proper. The distribution mains were connected to these switches through a short conduit riser terminating below the floor line, from which point the weatherproof mains were run on single wire cleat supports. The lighting mains underneath the buildings were let by contract as the Exposition's known light load was sufficient to warrant a definite size and plan to cover this requirement and to handle whatever day exhibit load might occur. The Exposition's power mains were only run as required and as the loads developed, the work being handled by the Exposition's own wiremen. A considerable saving was effected in the power mains to the Machinery Palace by making the trolley wires for the cranes operating in the central and side bays of the building, a much larger size than was indicated by the crane load. These wires served the double purpose of handling the pre-Exposition crane load and at a later date handling the exhibit motor load during the Exposition period.

Summarizing the activities of the department, it is noted that approximately 30,000 lineal feet of duct lines were laid to accommodate the primary distribution system throughout the main exhibit and State and Foreign Sections of the grounds, embracing more than a quarter million duct-feet. There are 40 miles of lead-covered primary cable and 101 miles of weatherproof and rubber-covered wire and secondary cable, 2,139 meters, 76 motors aggregating 1,600 horsepower, 139 oil switches, 517 transformers with a total capacity of 15,577 kilowatts and miscellaneous apparatus and materials.

Gasoline-Driven Winch in Operation and Take-Up Reel for Winding and Hauling Line.

In order to safeguard the power company and to insure the necessary amount of money to properly salvage this amount of material and return it to the warehouses, a sufficient sum of money is impounded each month during the Exposition period. At the close of the period this money is to be applied to the work of salvaging and the difference remaining will be returned to the Exposition Company as a final credit.

The writer is indebted to Henry Bosch, Jr., of the Pacific Gas & Electric Company, for the photographs shown in Figs. 2, 8 and 9.

Organization of the Department.

The organization of the Department of Mechanical and Electrical Engineering under the Division of Works was completed with the selection of Guy L. Bayley, as its chief and L. F. Leurey as assistant.

Mr. Bayley has been intimately connected with the pioneer development of hydroelectricity on the Pacific Coast. In 1899 he was sent to design and install a power house at Colgate, the first commercial hydroelectric plant in California. He remained in charge of the work until the first machine was put in commission and the first section of the power house had been completed. Following this he spent four years in Japan with the American Trading Company, two years as assistant and two years as general manager of their engineering department. During that time he laid out several of the largest electric railway and lighting plants in Japan and supervised their installation. In 1907 he assumed the position of resident engineer in charge of the power house, pipe lines and forebay reservoir on the Stanislaus power project in California, now an integral portion of the Sierra and San Francisco Power Company.

Mr. Leurey, who is engineer of operation and maintenance, prior to entering the employ of the Exposition was engineer of construction for the British Columbia Electric Railway Company of Victoria. Previous to that he was engineer of construction for Sanderson & Porter, of New York, on the Vancouver Island Power Company development in British Columbia, the Stanislaus project in California, the Spokane and Inland power project in Washington and the New Orleans Railway & Light Company reorganization in New Orleans.

A good demand for rectifying equipment has been experienced by the Childers & Waters Company, of Louisville, which has been making a feature of this business. The concern handles the line of the Lincoln Electric Company, of Cleveland, and has been devoting a great deal of attention to installations of this kind. A recent installation was made for V. A. Engelhard at 1128 Cherokee Road. The concern uses one man on this business exclusively, and an automobile is provided for him in order to enable proper service to be rendered.

BUSINESS HINTS FOR THE DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

The head of a prominent concern which does a big business in electrical contracting, as well as the sale of electrical merchandise, recently admitted that his credit losses were unreasonably large. Actual study of his books showed that they amounted to nearly 2.5 per cent on a gross business of $75,000. This meant, in effect, that the concern was losing $1,875 a year—certainly an excessive amount. It would be large enough, considered simply as an item against the total volume of business. But, as a matter of fact, this is not the correct way to consider it. The loss really comes out of the net profits, because, if the collections were made, they would be added to the net, inasmuch as all of the expenses of doing business have necessarily been paid from other sources. Thus, considering losses due to bad credits from this angle, it is evident that the contractor or dealer who permits the amount to reach 2 or 2.5 per cent of his gross is in reality forcing himself to charge off 15 to 20 per cent of his net profits. And knocking that large a hole out of net profits is something that nobody can afford—least of all the average contractor, whose expenses are increasing and whose margin of profit is steadily shrinking. The obvious moral of the whole proposition, of course, is that the contractor should be careful to whom he extends credit.

Exercising Mechanic's Liens.

The electrical contractor who has undertaken to install a wiring job is protected, theoretically, at least, in the event of the owner's inability or failure to pay, by a lien on the property. However, every state has a different law on this subject, and the requirements regarding exercising it vary widely. In most cases there is a definite limitation of time, and failure to exercise the lien within the specified period deprives the contractor of the right to secure his claim. The lien can also be used for the purpose of protecting the supply man, and if his materials are going into a job and it appears that the contractor to whom he sold is not going to pay, he can impose a lien and get his money direct from the owner. The operation of mechanic's liens is a more or less technical proposition, surrounded, as suggested, by the special regulations which each state has imposed; and hence it is part of the duty of every contractor and every electrical supply man to familiarize himself with these conditions and prepare to comply with them, in order that he may make use of this protection whenever the need arises. If this is done a long step can be taken toward cutting down credit losses on new work.

Credit Information is Available.

As a matter of fact, there is comparatively little excuse for any large volume of credit losses on the part of any merchant, no matter whether he is handling electrical or dry goods. The retail business, as such, is so well organized that credit information bearing on the rating of retail purchasers is just as easily available, and in as great detail, as it is in the case of wholesale buyers listed by Dun or Bradstreet. The electrical store should have access to this information, and having access to it, should make use of it. That is to say, when people ask for credit, whether it applies to installing a wiring job or delivering a piece of merchandise, the desirability of the account should be determined by consulting the "red book" or the "blue book" or whatever local volume has been compiled covering this feature. In addition, supplementary information may usually be obtained by asking for it, the average credit bureau of the local type having reporters who will get in touch with a large list of merchants and compile their experience regarding the individual under investigation. All this is done at a minimum cost, and, considering the amounts involved, the charge is nominal. The dealer or contractor who makes use of service of this kind forestalls credit losses by making them almost impossible. Of course, people with good credit are constantly losing it because of reverses of one kind or another; but it is always easy to locate and taboo those who have shown themselves to be unworthy of the privilege of credit, which is so thoughtlessly extended by many business men.

Exchanging Credit Information.

General sources of information, like those suggested above, are valuable, and give a good line on the prospective customer. At the same time, special information is always more enlightening than general. That is to say, an electrical contractor would much rather know what the experience of others in his own line has been with a certain customer than what the experience of furniture dealers and department stores may have been. While the experience of these merchants may coincide with that of concerns in the electrical field, it may differ widely. For example, a man who is regularly purchasing goods at a department or clothing store, and who desires to keep in good standing with those concerns, might, as a matter of policy, pay his bills there with reasonable promptness; and then, on the other hand, having one transaction with an electrical concern, which he did not expect to patronize again for years, if ever, he might decide without compunction not to pay the bill until he got ready. Consequently, for purposes of the electrical concern, the experience of others in the business is worth a great deal more than purely general data, valuable as the latter is at times.

This suggests that in every city where there is an organization of electrical interests—and this includes most communities of any size—part of the work be to exchange credit information, with special reference to the tabulation of those with whom the members of the organization have had unfortunate experiences. That is, while the ideal system would be to furnish a report covering every individual, the next best, a far simpler plan, would be simply a list of those who were unworthy of credit, as demonstrated by experience. Then every contractor and dealer could consult this list, which could be kept on file in the office of the secretary or some other central place whenever he secured a new account about which he was in doubt. This, too, would help to cut down losses from bad credits.

Occasional news stories are published about nervous householders firing at supposed invaders of their premises, only to find that they were perfectly innocent, and were either members of their own families, servants or others whose motives were far from criminal. The excitable individual who shoots first and investigates afterwards is usually regarded as a fit subject for satire and criticism.

But how about the contractor who takes a job and after he has got it well underway decides to investigate the credit rating of the customer? This is what a good many members of the trade do, if the statements of prominent contractors are to be taken at their face value.

"My policy," said a successful contractor, "is to investigate the credit rating and general desirability of every customer before starting the work. This is the only safe plan. To put men and materials on a job and actually getting it under way before finding out that it is a dangerous proposition, from a financial standpoint, is equivalent to locking the stable after the horse is stolen; at all events, it amounts to leaving the door open even with a known thief in the neighborhood. One of the reasons why the contractors lose so much money is that they pursue their credit investigations at the wrong time."

Getting the Money.

The difference between paper and actual profits is usually the difference between efficient and slovenly methods of billing and collecting.

The average person who owes money is inclined to pay it. Likewise, the average American has so many places to put his suprlus cash that the surplus disappears as rapidly as a June frost. Hence it follows that the merchants who get paid what they are owed are those who lose no time in putting their claims before the customer and keeping them there with a reasonable amount of persistence.

Good collection work, therefore, is just as necessary as good salesmanship or good workmanship on the job. In fact, it is more necessary than either of those, because it is the final step, by means of which the results of the labor that has gone before must be realized.

The electrical concern should not hesitate to use good men in collection work. They can be of service not only in getting the money, but in getting additional work. In other words, they can find out if the first job was satisfactorily performed, and if so, solicit other business, thus combining salesmanship with collections. This is a logical and practical method of handling the proposition and is being successfully employed in a number of notable instances.

To leave accounts that are overdue on the books and include them in paper profits is the poorest of poor policy. If the account is past due, tell the customer so by mail—and then go see him personally. Keep after him with a sharp stick until the money is forthcoming.

That is the final and most necessary link in the chain that is to hold profits in and keep credit losses out.

Public Service Commissions

Conducted by William J. Norton

DISTRICT OF COLUMBIA.

The Potomac Electric Power Company. The Public Utilities Commission has issued notice to the Potomac Electric Power Company and the Washington Railway & Electric Company requiring them to show cause why the rates of the Potomac Electric Power Company to private consumers should not be reduced, the reduction in rates to the private consumers to be made possible by the exacting of proper charges for power furnished the Washington Railway & Electric Company and its subsidiary railways.

The notice states that from the evidence before the Commission "the joint operative arrangement between the two companies is merely a device to cover what is in reality a sale of electric energy by the Potomac Electric Power Company to the Washington Railway & Electric Company," and that the amount paid by the railway company for energy furnished by the power company does not include interest or profit upon the property of the power company employed in its production.

Objection to a former hearing and investigation of the intercorporate relations was made by officials of both companies on the ground that no specific charges were preferred. Anticipating an appeal to the courts, the Commission issued its notice of further proceeding.

Concerning the contention of officials of the power company and railway company that when agreement is made between public utilities concerning the interchange of facilities, the Commission is without authority to act, "even when the rates are unjust or discriminatory," the Commission says:

"It is an ingenious argument to say that such agreements oust the Commission of jurisdiction and similar arguments have been invoked many times to the distortion of the evident intent of the statutes, but the framers of this law have provided against this very interpretation.

"And the framers further say that the provisions of the act are not to be construed strictly as against the Commission, but interpreted and construed liberally, in order to accomplish the purpose thereof."

The Commission cites its authority to make such investigations, as follows:

"The spirit and the letter of the public utilities law charges the Commission with ascertaining and keeping itself informed as to the manner and method in which the business of every public utility is conducted. It is charged with the supervision and regulation of the utility's organization, franchise, property, finances, accounting, rates, operation, and its compliance with every law applicable to it, including the provisions of its own charter.

"It is armed with ample inquisitorial powers to obtain information in any detail, and it is believed that just this sort of an arrangement is one which it is intended it should investigate and correct, if necessary."

GEORGIA.

Macon Railway & Light Company. The Commission has dismissed the application of the Macon Railway & Light Company for an increase in lighting and power rates. The present rates are those put in effect by order of the Commission, issued February 24, 1914. The order provided that, if after one year's trial the rates proved to be inadequate the Commission would "promptly undertake to revise them."

The rates became effective March 1, 1914, and the company entered its petition for a revision of the rates on June 9 of this year. The Commission, in dismissing the petition, holds that the company has failed to show that its "present scale of commercial and residential light rates and its retail power rates is not just and reasonable."

For the purpose of this petition, the company, while protesting that it was low, accepted the valuation placed by the Commission in the previous investigation. The present investigation involved only the ascertainment of the actual net earnings of the company under the new rates.

The Commission states that ascertainment of the net earnings of the company is made difficult by reason of the fact that the lighting business of the company is conducted in connection with its railway business, and the municipal lighting service in Macon is under contract to another company, but actually performed by petitioner, and, further, by the fact that the Macon Railway & Light Company is one of four public service corporations owned by substantially the same interests, with substantially the same general organizations conducting the four businesses jointly, with many expenses in common.

These four corporation are, the Central Georgia Power Company, which generates and sells electric current to the Georgia Public Service Corporation and to the Macon Railway & Light Company; the Georgia Public Service Corporation, distributing and selling electric current which it buys from the Power Company; the Macon Gas Light Company, manufacturing and selling gas to the public, and the Macon Railway & Light Company, using the electric current purchased by it from the Power Company in operating its electric railway system, and in serving its light and power patrons. This company also owns the municipal lighting system.

The Central Georgia Power Company is under a term contract to light the city at prices much below the actual cost of the service. Owning no lighting or distribution system, the common owners of it and the Macon Railway & Light Company, which owns the system, require the Railway & Light Company to carry out the Power Company's contract with the city, charging it with the current used, but allowing it to retain the proceeds from the service.

The actual out-of-pocket loss placed upon the Railway & Light Company by the Power Company in the fulfillment of the Power Company's contract is over $6,000 per annum, exclusive of interest on the investment, depreciation of, and taxes on the property in use, and administrative expenses.

The Commission holds: "If the net revenues from the entire business of the company are insufficient to meet fixed charges and pay fair dividends, this deficiency cannot be justly provided by increasing rates in the one department which is earning reasonable returns. If the business of the railway department and of the municipal lighting service is conducted without profit or at a loss, such losses cannot be recouped, under independent and separate rates, at the expense of light and power patrons."

Deducting the operating expenses, as charged in the books of the company, taxes, and depreciation at four and one-half per cent, the Commission finds that the company has earned 6.32 per cent.

Commenting upon this finding, the Commission says: "In considering the business of the company for the period mentioned, it should be borne in mind that the Commission rates, in effect on March 1, 1914, were very much higher than the exceedingly low rates previously prevailing as the result of the bitter contest for existence waged between the Railway & Light Company and the Georgia Public Service Corporation. Such an increase, in numerous instances where long-term contracts had been made, based on the low rates, occasioned some degree of dissatisfaction among the company's patrons, and doubtless for a time affected business.

"Within six months of the promulgation of the Commission rates the European war commenced, followed by depressing effects on business of every character throughout the world, and possibly nowhere in the United States more than in the cotton states. Conditions have not markedly improved as yet in this section.

"Following an increase in rates under such depressed business conditions, it is not surprising that the business of this company for the period under study, has fallen below normal. A return, however, of 6.32 per cent unquestionably compares favorably with returns for the same period in other lines of business in Macon.

"These observations are submitted, not by way of asserting that 6.32 per cent is a fair and proper return, but rather as suggesting that the business of the company during the past 18 months having been subnormal, results cannot and should not be taken as conclusive evidence as to the reasonableness of rates made effective and in operation under such conditions."

However, the Commission does not agree with the apportionment of expenses made by the company. The Commission allocated the expenses between the four companies upon the basis of the percentage of gross earnings of each company to the total of the four, and made a similar apportionment between the railway and electric departments.

The Commission's revision of the expenses for the year result in net earnings of 8.25 per cent on the value including working capital, as fixed by the Commission.

The order of the Commission authorizes the company to make a reasonable reinstallation charge, and it is estimated that this additional charge will furnish new revenue of $1,200 per annum.

INDIANA.

The Merchants Heat & Light Company. The Commission has denied the petition of the Merchants Company for permission to put in effect a schedule of rates for residence lighting on the "active room" basis, and the socket rate, which was fixed in its former order is to remain unchanged.

The Bureau of Navigation has now in the hands of the printer an edition of the "List of Radio Stations of the United States," which will be issued within a short time.

Daily Government Commerce Reports.

For many years there has been published by the United States Bureau of Foreign and Domestic Commerce, Washington, D. C., a little publication known as *Daily Consular Reports*, which contained valuable commercial information gathered by the United States consuls and consular officers throughout the world. Some time ago this was changed in title so that it is now known as *Commerce Reports*, so as to make more clear the nature of the information it contains. Believing that this information is of great value to manufacturing and commercial firms engaged in the export business, the government has recently increased the scope of the publication and thereby made it of still greater value. This is along the line of closer co-operation between the government agents at the principal trade centers in the various countries.

This daily publication is an official newspaper 6 by 9 inches and containing 16 to 32 or more pages, which furnishes the business man with a daily summary of market conditions in the different lines of industry throughout the world's markets. It contains notices of current changes in the tariff and trade-mark laws of foreign countries, direct cable information from American consuls and attachés and contains in almost every issue a list of foreign trade opportunities through which the exporter can get in touch with specific foreign business chances. Although published by the Bureau of Foreign and Domestic Commerce, *Commerce Reports* and its supplements can be obtained through the Superintendent of Documents, Washington, D. C., for the nominal subscription price of $2.50 per annum.

Picnic of Columbus Company's Employees.

At the annual picnic given by the Columbus (O.) Railway, Power & Light Company, August 27, to employees and their families nearly 8,000 buttons were issued granting free transportation over all the city lines, admission to Olentangy Park and the privilege of various amusements there. With the exception of the street car and power service, all activities of the company were discontinued for the day, in order that every employee might have a chance to enjoy the outing. A fine programme of athletic contests was under charge of a joint committee from the various departments. A purse of $15 was awarded in a missing man contest. The attendance at the picnic this year was 3,000 in excess of that of a year ago.

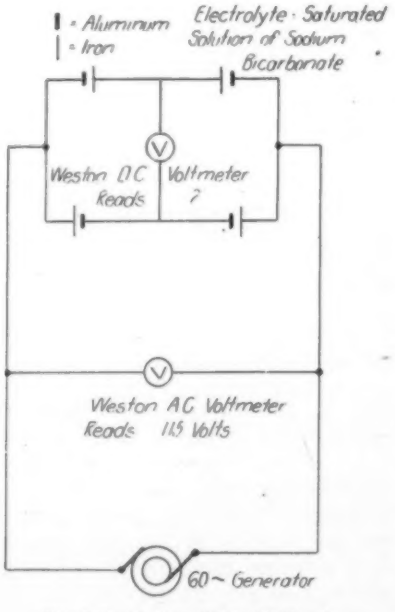
Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 303.—Rewinding Motor for Lower Frequency.—I have a three-phase, 220-volt, 60-cycle, three-horsepower motor which runs at a speed of 1,750 revolutions per minute. I wish to use this motor on a 25-cycle circuit and do not need more than two horsepower. I would be glad to know through the columns of your paper how I could wind this motor to gain this result. What would be its speed and would its efficiency still be high? At the present time it starts under full load with a high degree of torque and I would rather not change it unless I was certain of equally satisfactory results.—F. I. R., Auburn, N. Y.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectified direct-current voltage be?—A. G., Fort Monroe, Va.



No. 304.—Nodon-Valve Voltages.

No. 305.—Test of Ground Plates.—What is the best way to test the effectiveness of ground plates?—F. A. H., Chicago, Ill.

No. 306.—Cleaning Transformer Cooling Coils.—What is the best way to remove the deposit which has accumulated in transformer cooling coils without removing the coils?—F. A. H., Chicago, Ill.

Answers.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

Assuming the querist has reference to the total cost of rendering the bill, including meter reading, stationery, postage, office and incidental expense, the statement given seems to be about correct. It agrees closely with that given in the report of a well known light and power company in the West. This particular company operates a transmission system extending over a large territory and supplies about 35 towns. The monthly expense per customer taken over a considerable period of time averages as follows:

Meter reading	6 cents
Office work and billing	7 cents
Stationery and printing	3 cents
Collecting	5 cents
Trouble calls and repairs	4 cents

Considering the first three items only, gives a total of 16 cents per month per customer. The reason for the high cost of billing is evident from these figures.

This subject is being investigated very carefully by many companies and as a result numerous schemes have been worked out. The following will give an idea of the lines along which the various companies are working. One company employs traveling agents whose duty is to make collections, read meters and secure new business. These agents turn in daily reports to the superintendent's office, where all accounting and billing is done. Another company has a system so arranged that the meter reader makes out the bill when reading the meter, submits it to the consumer and makes collections when possible. This method works out very well in the smaller towns where the rates are not complicated. In Topeka, Kans., customers' electric service bills are made out on a postcard and mailed to the addresses without cover. This saves considerable stationery, postage and clerical expense. This plan has also been adopted by the municipal lighting department of North Attleboro, Mass. The saving in postage and clerical expense is reported as being from $700 to $1,000 per year. The form used has been approved by the postal authorities and carries the usual meter record data and amount of bill. In another vicinity the lighting company checks its town customers monthly and the rural-line customers quarterly. For the latter, a lineman is generally selected for reading the meters, for he can also attend to complants and inspect the lines. With him he carries miscellaneous supplies, such as lamps, fuses and other staple commodities. In addition, the meterman carries on each trip some specialty which he demonstrates to the customer. The sales results obtained from this practice have been very gratifying. The amount of study being expended on this subject in general is well shown by a recent development of the Eastman Kodak Company, which has designed a special camera for reading customers' meters. It is claimed the total cost of reading meters including the film and developing will not exceed one-half cent per meter.—G. A. S., San Francisco, Cal.

A method used by the Public Service Company of New Jersey to reduce the cost of rendering bills is to print a detachable coupon giving the essentials of the bill (customer's name, amount of bill and ledger number) with the request that, if a formal receipt is not especially desired, for the customer to detach the coupon and mail with a check and file the stub of the bill. This saves a two-cent stamp on nearly every bill paid by check.—D. M. L., Elizabeth, N. J.

No. 301.—Transformer Winding.—What size of wire should be used for primary and secondary winding for a transformer to step down 220 volts to 110 volts, capacity about 10 amperes? Also what quantity of wire of each size should be used? Does any manufacturer carry such transformers in stock?—R. D. F., Corona, Cal.

Transformers of this small size are generally kept in stock by manufacturers, but it will not be for just the exact output of 110 volts $\times$ 10 amperes $=$ 1.1 kilowatts, but probably for 1.0, 1.5 or 2.0 kilowatts. The choice can be made in accordance to the average load wanted; if 10 amperes is required permanently the 1.5 or 2.0-kilowatt transformer ought to be taken. If, however, 10 amperes is used intermittently, the 1-kilowatt transformer will do.

If the enquirer has an iron core and wants simply to put a winding on it, he could take for the secondary coil (110 volts) No. 12 B. & S. copper wire; for the primary coil No. 21 B. & S. wire. The weight of the wire depends of course, to a great extent, on the dimensions of the core; for a normal transformer of this size it will be about five pounds per coil.

For the case in question a simpler and cheaper solution would be an autotransformer, which can be applied if there is no objection to having the primary and secondary circuits connected. In this case only one coil is necessary with a tapping in the middle. The total pressure of 220 volts is impressed on the ends of the coil, whilst the supplied circuit is connected to the tapping and one terminal. This method ensures a higher efficiency, half of the current for the supply is taken directly from the line and the other half generated in the transformer (not considering the efficiency). In this case a wire of No. 20 B. & S. for the coil would be right, the weight approximately seven pounds. Since no information is given in the inquiry as to the iron part of the transformer, a more detailed reply as to number of turns, etc., can not be given. —H. A., Pittsburgh, Pa.

From this inquiry the following specifications for the design are understood or assumed: input, 2.2 kilovolt-amperes; frequency, 60 cycles; primary E. M. F., 220 volts; secondary E. M. F., 110 volts; ratio of transformation, 0.5. Since the output is of a comparatively low order, the transformer can be of the self-cooled type, with the coils and core mounted in a sheet-iron or pressed-steel case. Naturally, the design will be of the core type.

Magnetic Flux and Density.—For this capacity and frequency it is known that the flux should be about 0.23 megaline, or 230,000 maxwells. The magnetic density in transformer cores is rather low, especially in those for operation on 60 cycles. In some 60-cycle lighting transformers, the core density is usually from 35,000 to 40,000 maxwells per square inch. Here we will take 35,000 maxwells per square inch.

Design of Coils.—Calling E_p the primary E. M. F., T_p the number of primary turns, Φ the flux, and n the frequency, we have

$$T_p = E_p \times 10^8 / 4.44 \Phi n$$
$$= (220 \times 10^8) / (4.44 \times 230{,}000 \times 60)$$
$$= 360 \text{ turns on the primary (about).}$$

The number of secondary turns will be 360 turns multiplied by the ratio of transformation, or calling the number of secondary turns T_s, we have $T_s = 0.5 \times 360 = 180$ turns on the secondary.

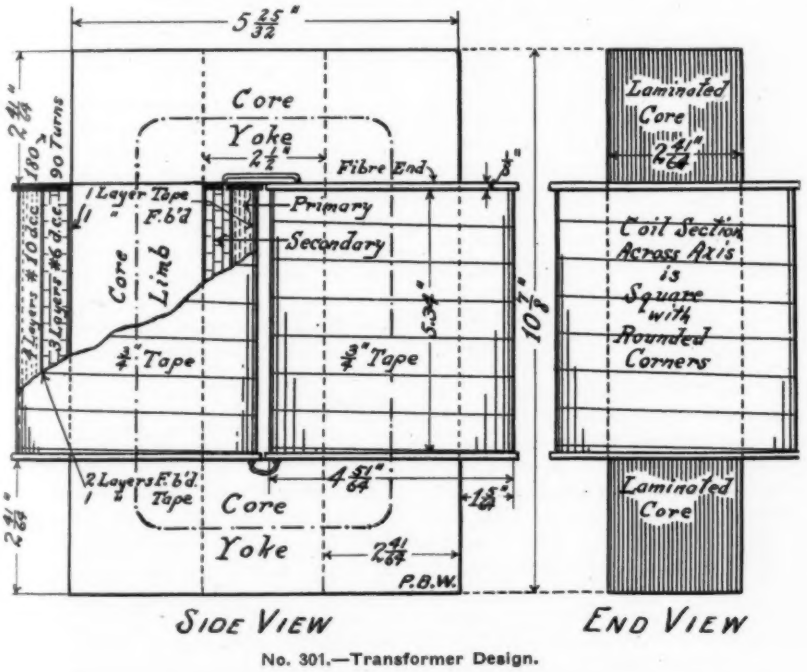
Primary and Secondary Currents.—Neglecting, for the present, the small current required to magnetize the core and supply the core losses, the primary current will be

I_p=watts/primary E. M.F.=2,200/220=10 amperes; and the secondary current will be

$I_s = 10 \times 220/110 = 20$ amperes.

Primary and Secondary Conductors.—In transformers there are no moving parts to set up air currents to carry off the heat; therefore a circulation of oil or air is maintained for that purpose. Because of the difficulty of dissipating the heat losses, and also because the losses must be made small in order to obtain a high efficiency, a liberal cross-section per ampere must be allowed in the primary and secondary conductors. In small core-type transformers the circular mils per ampere in the primary may be from 1,000 to 1,800 and in the secondary from 1,200 to 2,000. The space occupied by insulation in the secondary is usually smaller than that in the primary, and a more liberal cross-section per ampere can be allowed without making the secondary occupy any more room than the primary. Here we will take

Primary current density=1,000 circular mils per ampere.



No. 301.—Transformer Design.

Secondary current density=1,313 circular mils per ampere.

In small transformers the primary conductor usually consists of round, double-cotton-covered wire, and, in the present case, the same for the secondary conductor.

Allowing 0.4 ampere for magnetizing and iron-loss currents, we have for the primary current 10.4 amperes, which gives for the cross-section of the primary conductor

$10.4 \times 1{,}000 = 10{,}400$ circular mils;

the secondary conductor should have a cross-section of

$20 \times 1{,}313 = 26{,}260$ circular mils.

Hence we have primary conductor=B. & S. No. 10; secondary conductor=B. & S. No. 6.

Arrangemnt of Coils.—There are 360 turns on the primary and 180 turns on the secondary. Let us assume a core of the type as shown in the accompanying diagram, with 180 primary turns and 90 secondary turns on each limb of the core. Then taking three layers for each secondary coil and allowing for coil-end protection fiber forms one-eighth inch in thickness, the total coil-space length along a limb (since the lineal space of double-cotton-covered No. 6 B. & S. copper wire =0.178 inch) is $0.178 \times 90/3 + 2 \times \frac{1}{8} = 5.34 + 0.25 = 5.59$ inches.

Now No. 10 B. & S. double-cotton-covered wire occupies for one turn the lineal space 0.114 inch; hence the first layer of the primary must contain 5.34/0.114=46 turns, the second layer 45 turns, the third layer 45 turns and the fourth layer 44 turns. The secondary (No. 6 B. & S.) will be wound next the core and the primary wound outside the secondary.

The insulation between the iron and each secondary coil will be a thickness of fullers' board wrapped over with a thickness of tape; and between primary and secondary a thickness of fullers' board wrapped over with a thickness of tape, which in turn may be covered with another thickness of board. The outside of each double coil may be protected by a thickness of board wrapped over with tape. Hence we have for the radial thickness of each assembled double coil:

4 layers No. 10 B. & S. d.c.c.=0.448 inch.
3 layers No. 6 B. & S. d.c.c.=0.534 inch.
4 thicknesses fullers' board=0.050 inch.
3 thicknesses tape (½ lapped)=0.045 inch.
Total radial thickness =1.077 inch,

which is practically 1 5/64 inches.

Core Dimensions.—Since the dimensions of the coils have been fixed, the space they will occupy can now be determined. Each core limb (that part about which the coils are wound) must have enough cross-sectional area to carry the flux without exceeding the assumed density of 35,000 maxwells per square inch, that is, the cross-section must be 230,000/35,000=6.56 square inches net. If only 95 per cent of the cross-sectional area is iron, the gross area must be 6.56/0.95=7 square inches (about), which will give us a

square core=2.64 inches or, say, 2 41/64 inches on a side. The core will be made of transformer core laminations.

For the distance between the inside edges of the limbs we have

Twice radial thickness coil=2 5/32 inches
Allowance between coils = 11/32 inch

Inside distance =2½ inches.

Without going into further details of the design, the total length of the primary figures out at 431 feet or about 13.5 pounds; of the secondary 180.5 feet or about 14.4 pounds. The efficiency will range from 92.4 per cent at one-fourth load to 95.3 per cent at full load.—P. B. W., Verbena, Ala.

No. 302.—Air and Electric Rock Drills.—Are electric rock drills used to any extent for preparing holes for blasting in quarries, tunnels and metal mines? How do they compare with air drills? Where air drills are used is it better to supply them from a central compressing plant or from small, portable motor-driven compressors near the place where drilling is being done?—J. B. L., Albuquerque, N. M.

Electric drills are not in use to the extent that one would expect. The chief reason is that the drills first placed on the market were unable to meet the severe conditions imposed upon them, with the result that electric drills in general came into bad repute. The difficulties have now been overcome, however, and there are several drills now on the market that have in the last year or two proved themserves reliable, rugged and practical. These drills are of high first cost, and it is this fact that is the real deterrent at this time; but this will solve itself as time goes on, according to the law of supply and demand. The advantages of the electric drill over the air drill (and they apply even more so to the steam drill) are: saving in power consumption, amounting generally to 70 to 85 per cent; greater flexibility and efficiency of transmission and conversion; cuts from 50 to 100 per cent faster; absence of compressor plant; saving in cost of moving from place to place, it being a simple matter of connecting lengths of wire instead of cutting and fitting lengths of pipe; fewer delays chargeable to either the drill or the transmission system.

Whether it is better to use several small motor-driven compressors or one centralized plant depends upon circumstances, and each case must be decided upon its merits. The more important factors entering into a decision are: the kind of work being done—mining, tunneling or quarrying; the amount of rock thrown down; whether the drilling is being done on the vertical or horizontal; amount of drilling and amount of rock removed per diem; the ease with which the fallen rock may be removed. Usually the centralized compressor plant will show the lower operating costs and the higher efficiency, whereas the smaller units may save quite an appreciable amount of time due to the smaller delay where the work moves rapidly. The fact that one compressor station makes all the air equipment dependent upon it may be a disadvantage. When a blast is made pipes are apt to be covered up with the fallen rock, and damaged, whereas wires can be quickly and easily removed out of the way. The cost of maintaining a piping system may be quite a high item where the speed of travel is high. The loss in transmission is not very serious where large pipes are used, although the leakage and friction losses where the air is distributed to the various machines may become a serious matter, especially if there are many machines to be supplied.

The writer has had some experience in electrically operated stone quarries and in a 7,000-foot tunnel and in both these instances the electric drill was used because it permitted the lower operating costs, the greater flexibility and the greater speed. It seems that there is little excuse for the small motor-driven compressors, unless it be in mine work, or where several drills are to operate together at a distance from the main plant. The electric drill is more efficient than the combined motor, compressor and air drill, it is more transportable and the cost is about the same when all the various factors are taken into consideration. There are cases where the small compressor units would probably mean lower first cost and operating expense probably, but in a general way the electric drill seems the more preferable, especially where only one drill is required to work in the same location at a time. A careful analysis of the costs for the various factors would be necessary before a definite statement could be made. The electric drills are now being used by a number of large contractors for extremely severe, continuous-duty service and are giving satisfaction. Under such conditions they pay for themselves in the saving of power, alone, in a year to eighteen months.—K. R., Chicago, Ill.

Scandinavian Railway Electrification.

The most northerly railway in the world has its terminus at Narvik, on the northwest coast of Norway, latitude about 68½ degrees, 130 miles north of the Arctic Circle. This railroad runs east, across the narrow part of Norway, and then southeast through Kjeronavare and Gellivare, which are the principal iron-ore centers of Sweden; thence it proceeds southeast to Lulea, an important port on the Gulf of Bothnia, and connects at Boden with the railroad to Stockholm. Some iron ore is shipped southeast to Lulea, and thence, by sailboats and steamers, to German ports on the Baltic; but the inland port of Lulea, though in latitude 65½ degrees, is much more obstructed by ice than the more northerly port of Narvik, in Norway, which is called an "ice-free port." Hence, most of this iron ore moves through Narvik, whence it is shipped to both German and Baltic ports. The distance from Kjeronavare to Narvik is 110 miles, of which 85 miles are in Sweden and 25 miles in Norway.

The Swedish portion of this road has recently been electrified, the current being obtained from the Porjus Waterfall, at a distance of about 70 miles from the railroad. At that point 40,000 horsepower is being generated for railroad purposes and carried by overhead wires at 80,000 volts. It is claimed that the installation of electric drive on this railroad has increased the weight of the possible train as much as 40 per cent and has increased the speed 50 per cent. The 25 miles in Norway are still steam-driven, but present a splendid opportunity for electrification. The southern end of this road, from Kjeronavare to Lulea, is 200 miles long. This may also be electrified in the future.

The scarcity of coal throughout the Scandinavian countries and the abundance of water power create an ideal situation for an unlimited development of electric generation and transmission throughout the kingdoms. Much interest is being taken in the electric smelting of iron ores, and it is predicted that before many years the shipment of iron ore from Sweden will give place to that of pig iron. Some pig iron is already being shipped to Germany and to England.

Proposed Municipal Electrical Supply for Baltimore.

The municipal officers of Baltimore, Md., have under consideration a plan by which power for lighting purposes may be drawn from the Jones Falls water supply. If used only for lighting municipal buildings it would save the city approximately $50,000 a year, it is said. The only cost would be the installation of the necessary machinery, which would not be very expensive. It is said that the establishment of the proposed plant will constitute one of the more notable municipal improvements to be effected by the present administration. The plan had its origin in a desire to find some profitable use for the Jones Falls water supply. The details of the plan are being worked out carefully, and until the engineers who are in charge of this work submit their report it will not be known whether the electricity to be supplied by Jones Falls will be utilized only for the illumination of the parks or whether cables will be installed in the electrical subways for street lighting.

Street Lighting in Chicago.

The eighteenth annual report of the Department of Gas and Electricity of the City of Chicago, which was recently issued by the former commissioner, Ray Palmer, contains some interesting figures upon the cost of electric lighting in the streets of that city. The accompanying tables show some of the figures in this connection.

TABLE I.—COSTS OF MUNICIPAL ELECTRIC STREET LIGHTING SYSTEM—1914.

Items.	Open Direct Current Arc.	Inclosed Alternating Arc.	Flame Arc.	Four-Ampere Tungsten	300-Watt Tungsten	Total
Average number of lamps	935.7	6,253.6	10,168.9	4,920.9	767.4	23,046.5
Sanitary District power	$9,393.50	$62,740.02	$105,183.29	$8,738.61	$5,474.13	$191,529.55
Substation operation	920.32	6,150.84	10,301.88	856.69	536.73	18,766.46
Carbons and renewals	4,522.60	4,872.97	68,351.03	2,205.40	3,534.82	83,486.82
Globes	468.70	2,699.26	6,056.52	1,808.41	107.98	11,140.87
Repairs to lamps	2,220.00	11,698.55	17,544.84	.....	100.00	31,563.39
Trimming, cleaning and patrolling	14,515.00	48,898.75	75,128.55	13,634.50	3,639.88	155,816.68
Repairs to circuits, conduits and posts	4,358.41	29,142.66	47,339.34	22,920.63	3,575.41	107,336.45
Miscellaneous expense, including street car transportation of patrolmen	120.00	1,032.40	1,720.65	100.00	50.00	3,023.05
Supervision (office expense)	327.33	2,188.86	3,551.40	1,722.68	268.65	8,058.92
Total	$36,845.86	$169,424.31	$335,177.50	$51,986.92	$17,287.60	$610,722.19
Cost per lamp	39.38	27.09	32.96	10.56	22.54	.....

TABLE II.—DETAILED COSTS OF ELECTRIC STREET LAMPS—1914.

	Open Direct Current Arc.	Inclosed Alternating Current Arc.	Flame Arc.	Four-Ampere Tungsten.	300-Watt Tungsten.
Sanitary District power	$10.03	$10.03	$10.34	$ 1.77	$ 7.14
Substation operation	.98	.98	1.01	.17	.70
Carbons or renewals	4.83	.78	6.72	.45	4.61†
Globes	.50	.43	.60	.37	.14
Repairs to lamps	2.38	1.87	1.73	.....	.13*
Trimming, cleaning and patrolling	15.52	7.82	7.38	2.77	4.74
Repairs to circuits, conduits and posts	4.66	4.66	4.66	4.66	4.66
Miscellaneous expense, including street car transportation of patrolmen	.13	.17	.17	.02	.07
Supervision (office expense)	.35	.35	.35	.35	.35
Total	$39.38	$27.09	$32.96	$10.56	$22.54

*This item will probably increase in future years.
†This is low for this year, as all of the lamps have not been in service for their full renewal period and will be increased by $3.00 under present conditions, though the tendency will be toward a reduction due to decreased cost of and increased life of lamp.

TABLE III.—ORIGINAL COST AND DEPRECIATED VALUE OF CITY ELECTRIC LIGHT SYSTEM.

Distribution.	Cost.	Sale and Dismantling.	Depreciation.	Value.
Ground	$ 86,508.06	$ 23,040.50	.....	$ 63,467.56
Buildings	319,719.97	61,485.31	$ 35,231.46	223,003.20
Steam plant	422,803.44	25,424.98	246,292.29	151,086.17
Electric plant	769,148.09	36,089.98	246,234.82	486,823.29
Crematory	1,630.00	1,630.00	.....	.....
Repair shop equipment	11,386.18	.....	11,386.18	.....
Lamps	629,088.85	.....	225,961.78	403,127.07
Circuits	3,446,225.25	34,645.13	758,723.44	2,652,856.68
Conduits	1,790,483.85	.....	498,686.30	1,291,797.55
Posts	590,307.58	.....	144,224.13	446,083.45
Totals	$8,067,301.27	$182,315.90	$2,166,740.40	$5,718,244.97

TABLE IV.—OPERATING COSTS OF ELECTRIC STREET-LIGHTING SYSTEM DURING 1914, BASED ON AN ESTIMATED VALUATION.

Items.	Direct Current Open Arc.	Alternating Current Inclosed Arc.	Flame Arc.	300-Watt Tungsten.	Four-Ampere Series Tungsten.	Totals.
Ground rent	$ 41.86	$ 274.06	$ 1,031.98	$ 49.33	$ 260.37	$ 1,657.60
Office rent	25.24	165.42	622.56	29.76	157.02	1,000.00
Taxes	1,676.03	10,975.21	41,360.81	1,976.04	10,425.20	66,413.29
Depreciation	5,194.09	34,033.68	128,201.50	6,122.46	32,312.98	205,864.71
Interest	4,074.11	26,768.71	100,522.69	4,807.53	25,349.48	161,462.52
Proportion of other departments' salaries	38.15	249.81	941.05	44.97	237.02	1,511.00
Total	$11,049.48	$72,406.89	$272,680.59	$13,030.09	$68,742.07	$437,909.12
Cost per lamp	11.80	11.58	26.80	17.00	13.99	.....
Cash cost per lamp	39.38	27.09	32.96	22.54	10.56	.....
Total cost per lamp	51.18	38.67	59.76	39.54	24.53	.....

Table I gives a summary of the costs, distributed according to type of lamp and to objects of expenditure. These figures cover only what may be termed operating costs. Similar figures are given in Table II in terms of a single lamp as unit.

To arrive at the total cost of this service to the city, an appraisal has been made of the property used in street lighting service, so that a proper allowance may be made for interest, depreciation and other fixed charges. Table III gives the items entering into this appraisal, and Table IV gives the distribution of the fixed charges among the different types of lamp. To the totals for each type are added the maintenance costs already given in Table II to arrive at the total cost to the city per lamp.

To arrive at the values given in Table IV, allowance for ground rent has been made upon the basis of four per cent of the actual value of the ground used by the department and belonging to others. An arbitrary charge has also been made for office rent in the City Hall. The item for taxes is arrived at by applying the actual tax rate to one-third of the estimated value of the plant, according to the legal method in use in taxing all property. Interest upon other property used in the service is charged at the rate of four per cent. An arbitrary charge is made to cover the service rendered by the corporation counsel, the city comptroller and others. The rates of depreciation used ranged from 1.08 per cent on buildings to 6.66 per cent on lamps.

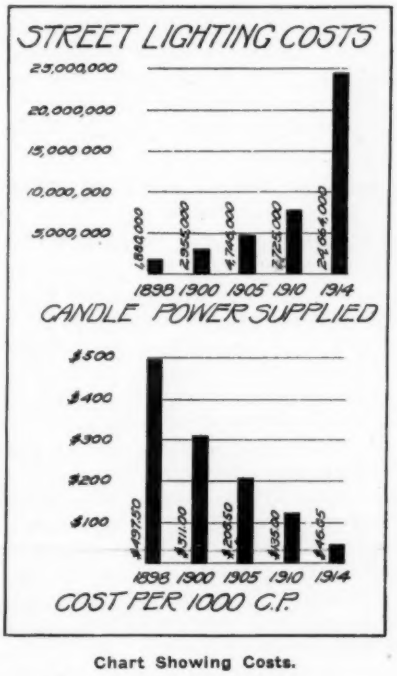


Chart Showing Costs.

The chart shows the rapid increase in the amount of street lighting provided during a period extending from 1898 to last year. It also shows the enormous decrease in the cost to the city per candlepower supplied.

New London Electric Railway.

The London and South Western Railway inaugurated the first portion of its electric train service for London suburban lines on Sunday, August 29, the completed lines being between East Putney and Waterloo. The construction is proceeding of the "Kingston Roundabout" as it is termed, including the Kingston, Wimbledon, Richmond, Twickenham and Teddington lines.

Water-Power Utilization in the West Considered by Governors.

The eighth annual Conference of Governors was held at Boston, Mass., August 24-27. About 30 present executives and 15 ex-governors, many of them with their wives, were in attendance.

The subjects discussed included national defense and preparedness, the development of the West, the governor's initiative, economy and efficiency in state administration, the abolition of capital punishment and the vital questions relating to the proper utilization of water powers in the arid states of the West.

Gov. George A. Carlson of Colorado was on the program for a paper on "State or National Control of Water-Power Sites," but was unable to be present. Instead, a paper by Ex-Gov. James H. Hawley, of Idaho, was received by the Conference as a part of the proceedings. The following forms part of this paper:

Federal or State Control of Water Power.

"To my mind, the subject presents two phases—(1) a broad question of constitutional law, involving the great potential interests dependent upon the control of the public lands and the unused water power, not yet reduced to private ownership; and (2) a question of sound public policy equally important to the states directly affected and to the nation. Upon both questions a seemingly irreconciliable conflict has developed; theories directly antagonistic are urged. There is apparently no middle ground upon which the contenders can meet and there weld their divergent views into a common idea."

Mr. Hawley holds that the issue involves the idea of state sovereignty as to the control, use and flow of the waters of a state, except navigable streams—a principle in which the Federal Government has concurred, in its policy of admitting new states to the Union.

"The right to use the waters means the right to use the abutting lands necessarily involved in perfecting such use. The conditions existing in the arid regions and mining sections of the West have since their first development necessitated the use of the near-by waters and made it equally necessary to have the right of way over the adjoining lands for the conduits used in conveying the waters to the farm or mining claim. Ordinarily, the places of diversion were in localities where the land was of no intrinsic value and therefore remained the property of the United States.

"The act of 1866 embodied in the statutes of the United States was the first Federal legislation on this subject and did 'grant, acknowledge and confirm' the right of way for the construction of ditches and canals over the public lands 'whenever by priority of possession, rights to the use of water for mining, agricultural, manufacturing or other purposes has vested or accrued, and the same are recognized by the local customs, laws and the decisions of courts, the possessors or owners of such vested rights shall be maintained and protected in the same.'"

Mr. Hawley pointed out that rights of way over public lands do not depend on the section quoted, but on the local laws themselves, the underlying principle of which being the right to acquire, divert and use the streams, and an easement over the lands necessarily crossed by conduits conveying the waters to the place of use.

"The sovereign control of the waters within their territorial limits concededly being in the states, and an easement over adjoining lands being necessary to utilize such waters, and such easement having from time immemorial been recognized by the United States, is there any authority on the part of the general government either through future legislation or by action of its officers under existing statutes, to prevent the full use of such waters under the statutes of the states affected, by reserving the ultimate ownership of the lands necessary to be used in the development of hydroelectric energy, and preventing the use by the state or under its laws of its waters for such purpose?"

It was pointed out that the water powers of most of the inter-mountain states are their most valuable asset. An arbitrary refusal by the national government to dispose of lands so they can be used by owners of the water would render such waters valueless, and places the government in a position to hold up the developer of waterpower, after the manner of the highwayman. The writer characterized the Ferris bill, now pending before the Senate, as a deliberate attempt to deprive the states of the control of their streams.

This act directs the Secretary of the Interior to lease public lands for 50 years for the construction and operation of power houses, dams and conduits, and transmission lines, and provides that no lease shall be granted without the applicant first having obtained the right from the state or states in which the project is located to sufficient water to develop the power. The Interstate Commerce Commission is given the power to regulate and control service, rates, and stock and bond issues, when the lessee operates an inter-state system. Section V of the bill gives the United States the right to take over after three years prior to the expiration of the lease all property dependent on the continuance of the lease. Section VI provides for re-leasing of the property. Section VIII authorizes the Secretary to fix the rental, and provides that 50 per cent shall be paid to the state and 50 per cent to the reclamation fund, and Section IX gives the Secretary full power to regulate rates and service in states where no public utility commission exists.

The objection is made that government regulation and control of properties within a state is a measure of interference not warranted by the Constitution, and that the provision which authorizes the Secretary to fix charges on the amount of power developed and sold by the lessee makes an excise tax on the industry.

"I concede," says Mr. Hawley, "that the general government has full power of regulation and control of matters of this kind devoted to interstate uses, but laws conferring such control should be uniform. * * * No serious attempt is made by the friends of the Ferris bill to deny that by this legislation it is intended to vest in the government powers which have heretofore been exercised wholly by the states. The main argument in favor of the bill is one of expediency.

"The proposed legislation is ostensibly a conditional grant for a limited time of the right of way over the public domain for the uses incidental to the development of hydroelectric power. In reality it amounts to an effort to establish a new system of government for the control of all future water-power industries established on or requiring the use of the public domain, and to vest all authority regarding it in the administrative department of the Federal Government, and divest the states of any power therein.

"The argument is used that waters in arid states are of use only with the land of the public domain, and the United States being the owner, it is proper for it to assume control of industries built up by the combined use of land and water. If this reasoning is correct, then the state might pass a law prohibiting the use of water on the public domain and thus confront us with a situation under which the development of our power resources would be forever impossible."

It was pointed out that the government, in being vested with the ownership of public lands, held them merely as trustee for the future states. An act like the Ferris bill would tend to centralize control in the general gov-

ernment, of many matters over which the states heretofore have had sole jurisdiction.

"The theory of renting the abutting lands essential to power sites is an injustice to the renter himself, as against the fortunate ones who have already become owners in fee of similar facilities," the writer of the paper maintained. "The rental system would make values uncertain and prevent the ready sale of bonds for new enterprises. The amount received from rentals would be immaterial to the government. The provision that the state shall receive a part of the proceeds is merely a sop.

"The worst feature of the bill is that under it the ownership of abutting lands will give absolute control over the adjacent water power. The land may be valueless; the water has great value. Still, the control of the valuable asset is attempted to be usurped by the government because it owns the lands.

"The northwestern states are blessed with an almost unlimited amount of water power. The necessities of these states demand the fullest development of their power facilities. The gravity systems of irrigation have practically been completed; the remaining supply of running water is below the lands upon which it should be used, and this water can be put upon these lands only by the use of hydroelectric power. Mining and manufacturing also require cheap power. It is held by some that a definite demand should precede the development of power. This is not a correct doctrine. When electric power is developed, the owners are bound to find markets for it. When opportunities offer, all mining, agricultural and manufacturing machinery will be run by electric power. Our urban and interurban railways, and even transcontinental railroads, can use electricity alone as motive power; the use of electricity will enter into every phase of our domestic and business lives."

The paper concluded with a plea that the states be given the same right of control over power sites as they have now over the water which generates the power. Or, if this is impracticable, suggests Ex-Governor Hawley, give opportunity to investors to acquire absolute title to the sites, in the same easy manner as for government lands for other purposes, and at a reasonable cost, to be determined beforehand by the proper officials. There would be no possibility of hurtful monopoly, with public utility commissions existing in every state.

Conservation of Natural Resources.

Another address of the session was by Governor Ernest Lister, of Washington, on "Conservation of Natural Resources." He said that of the 69,000 square miles of area of his state or 44,241,000 acres, 9,828,000 acres are held by the United States as forest reserve, and 1,831,000 acres are owned by the state or held by private interests as forest reserves. He held that conservation of resources means not withdrawal from use, but development and wise utilization. Great undeveloped water powers are running to waste. Power aggregating 4,932,000 horsepower is available for hydroelectric generation, basing the estimate on an efficiency of but 75 per cent, while developed power amounts to but 306,000 horsepower or only six per cent. In Oregon, 3,148,000 horsepower are available and only 105,000 horsepower, or three per cent used; and in California 3,424,000 horsepower are available and only 430,000 horsepower, or eight per cent utilized.

In Oregon and Washington vast tracts of land could be reclaimed from arid desert by electrically driven pumping. One tract of 160,000 acres could be reclaimed by the utilization of a single hydroelectric project on the Columbia River. Electric power, he claimed, is the only power practicable for reclaiming the dry lands for human habitation; the lands thus irrigated would furnish homes for hundreds of thousands of people.

In Washington are 7,386 miles of steam railroads which could advantageously be operated by hydroelectric power. Governor Lister cited the Chicago, Milwaukee & Puget Sound Railroad, which has undertaken the electrification of 450 miles of main line, which, he said, is proof that electrification is a good business proposition. He quoted John D. Ryan, of the Montana Power Company, who testified before the Public Land Committee of the Senate that this railroad will pay about $550,000 a year for electrical energy. Heretofore its coal has cost about $1,750,000 per annum, besides requiring about one-third of the railroad's equipment to haul the coal. The Butte, Anaconda & Pacific Railroad pays about $96,000 for energy to operate 80 miles of railroad, whereas coal formerly used cost $270,000 a year. It is estimated that all the railways in the three Pacific Coast states would require between 700,000 and 800,000 horsepower for operation, and this amount of power would be but a small part of the available supply. Besides these economies, Governor Lister pointed out that forest fires, now a source of great loss, and in a large measure attributable to steam railroads, would be greatly diminished under electric operation.

In addition to manufacturing, mining and railway operations, the production of fertilizers through atmospheric fixation of nitrogen by means of electric power would be a source of great wealth to the whole country. It is said that the nitrates of Chile are fast being exhausted and will be extinct in about 20 years. The use of 200 pounds of this fertilizer to the acre in Europe, as compared with 28 pounds in the United States, results in wheat crops of thrice the number of bushels per acre. This larger figure would be possible here, if the production of fertilizers were undertaken with the aid of electrical energy.

Governor Lister held that investments in water powers should be assured of a reasonable return. Under present Federal laws, such a condition is lacking, and it should be the work of Congress to legislate favorably to hydroelectric development. He believed state public service commissions should exercise authority over water powers, and that provision should be made for the people to acquire plants at a reasonable value, which should leave out of account the intrinsic value of the waters. He said the streams are the country's "most valuable resources."

Youngstown Dedicates Street-Lighting System.

On August 18, Youngstown, O., dedicated a new street-lighting system which is notable because it is one of the most extensive exclusively Mazda C street-lighting systems in the United States and also because of the short period required for installing a large number of ornamental standards which required the laying of nearly five miles of underground circuits along downtown streets. In addition to the ornamental standards there are 185 miles of streets lighted by lamps supported by brackets extending from wood poles. Operations were begun on March 3, 1915.

The installation consists of 257 1,000-candlepower, 20-ampere series Mazda C lamps and 288 600-candlepower 6.6-ampere series type C lamps mounted on ornamental metal standards and inclosed in Novalux Polycase glassware. The higher candlepower units are confined to and in the immediate vicinity of the downtown section known as "The Diamond," a public square at the intersection of Federal and Market Streets and Wick Avenue.

A feature of the Youngstown installation is the use of a series transformer in the concrete base of each lighting standard which leaves the standard free from high-tension circuits.

Standards are space from 50 to 75 feet, opposed, on downtown streets, which affords an unusually high light intensity. The light center of the lamps is 14 feet 6 inches above the curb.

The installation was made by the Mahoning & Shenango Railway & Light Company, of Youngstown.

Engineers Present Open Letter to Chairman of New York Constitutional Convention.

The Committee of Engineers representing national and local engineering societies organized to present recommendations to the New York Constitutional Convention has sent the following open letter to the Convention chairman:

New York, August 25, 1915.

Honorable Elihu Root, *Chairman*,
New York State Constitutional Convention,

Under date of April 20th, this Committee, which has been officially designated by the governing bodies of national and local engineering societies to represent them at your Convention, forwarded an open letter to the Convention, setting forth certain principles which, in its judgment, should be incorporated in the State Constitution when amended, to the end that the engineering work carried on under our State Government might be placed upon a high plane of efficiency, comparable with that essential to the successful management of large undertakings under private control.

The societies represented comprise the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Consulting Engineers, the New York Section of the American Institute of Mining Engineers, the Municipal Engineers of the City of New York, and the Brooklyn Engineers Club, with a membership collectively of approximately 30,000, of whom about 6,000 reside in the State of New York.

Our recommendations related particularly to the administration of the public works, the control of State lands, conservation of the State's resources, and the regulating of public utilities. Concerning all of these functions bills prepared along the lines suggested have been formally introduced or have been presented for committee consideration.

An examination of the proposed amendments as reported to the Convention by its various committees shows that it is only proposed to adopt in part the principles we urge. Before final action is taken by the Convention we venture to approach you again with the hope that the principles to which we refer, may, after further careful consideration, receive your final support.

Management of Public Works.

In the bill prepared by us and presented by Mr. Latson (Introductory No. 404) we have provided for placing the sole management of the various engineering activities of the State, control of the State lands and buildings, and jurisdiction over all conservation projects, in a "Department of Engineering and Public Works," to be headed by three commissioners, each to hold office for a term of twelve years, and to have qualifications fitting him to fulfill the duties of his office. This measure also provides for the subdivision of the work of the department among suitable bureaus, and for heading each engineering bureau by an engineer selected with sole regard to his qualifications.

The amendment reported by your Committee concentrates these functions, excepting those relating to park control and development, and to conservation, in a "Department of Public Works" to be administered by a Superintendent appointed by and removable by the Governor. It is proposed to place the conservation functions in a separate department, but no provision seems to have been made for assigning definite jurisdiction over the State parks other than the forest preserve. While no term of office is prescribed, it is likely that the past custom will be continued and that a new Superintendent will be appointed by an incoming Governor. By omitting definite provision for engineering bureaus, the way is left open for successive legislatures to bring about changes in the management of the public works of a character fully as radical and injurious as those which have been made in the past.

Continuity of control is absolutely requisite to the successful conduct of the State's public works, the management of public property, and the regulation of public service corporations, but this important principle has been entirely omitted from the provisions recommended by your Committee, although the desirability and practicability of securing such continuity has been recognized by other committees of the Convention in their recommendations concerning conservation and public utilities to which further reference will be made.

We strongly urge upon you the desirability of making radical changes in the plan proposed by your Committee, to the end that the importance of securing continuity of purpose and control will be given recognition.

Conservation.

The present State Constitution deals with this function in an ultra-conservative way, the basic idea being apparently a prohibition against any attempt at scientific forestry or development in order that mismanagement might be avoided. With control over and responsibility for the State lands and forests definitely placed in a well-organized department, such as is proposed by us in the bill presented by Mr. Latson, it would seem reasonable to remove all unnecessary restrictions and to open the way for treating this important factor in the development of the State with the intelligence and businesslike efficiency which it deserves, by making it practicable not only to cut such trees as scientific forestry would require, but also to readjust property holdings whenever public benefit might thereby accrue.

In the amendment proposed by your Committee, provision is made for a nine-headed commission, each member of which would have a nine-year term, and the prohibitive features of the 1894 Constitution are largely retained. While the adoption of this plan may insure honest administration, its restrictive provisions are framed on the idea that the State can only insure itself against wrongdoing by closing the doors to progress. Assignment of responsibility to so large a body, the unpaid members of which cannot be expected to give their sole attention to their office, is not conducive to efficiency. In our judgment the day when corruption of public office will be tolerated is past, and the remedy against such abuse is to insure fitness for office and definite responsibility on the part of department heads.

We urge that the broader view of this question be favored, as more particularly detailed in the drafts prepared by our Committee providing for amendments to Article 1, Section 7, and to Article 7, Section 7, of the Constitution.

Public Utilities.

In our bill, presented by Prof. O. H. Landreth (Introductory No. 688), provision was made for one five-headed commission, each member of which should have a ten-year term of office and possess qualifications which would fit him for his duties. The bill also defined the functions of the commission.

In the amendment proposed by the Committee of the Convention the jurisdiction, powers, and duties of the commission are left subject to determination by the Legislature, two five-headed commissions are proposed, the term of office is made five years, and no qualifications are named for appointees.

In general, the proposition of your Committee is along the lines we have suggested but, in our judgment, greater advantage would result to every public and private interest if the bill above referred to was substituted.

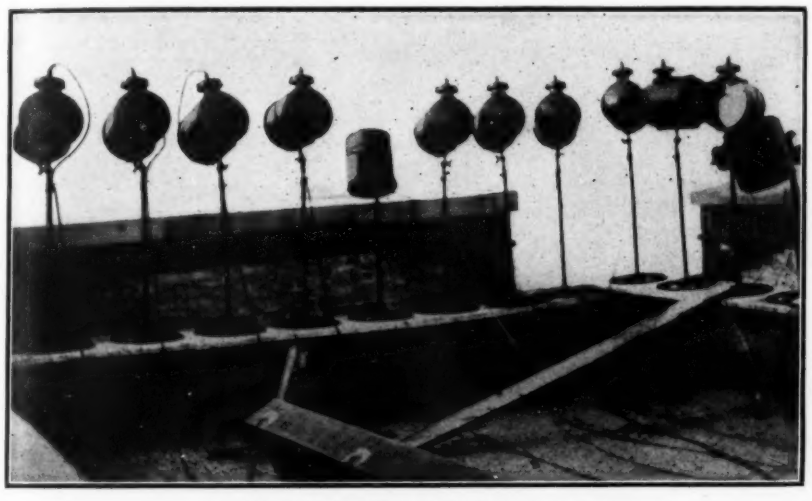
Very respectfully yours,

Arthur S. Tuttle, Chairman.
Calvin W. Rice, Secretary and Treasurer.
E. J. Mehren, Assistant Secretary.

Projector Lighting for the Protection of Bathing Beaches.

For several years the public park and municipal authorities of Chicago have tried to promote the more advantageous use by the public of the city's 22 miles of frontage on Lake Michigan. One means of attaining this was the opening of a number of municipal beaches, which added greatly to the facilities formerly provided by the beaches privately owned. As a result, this summer has seen considerable increase in patronage of both public and private beaches, despite unseasonable weather.

It is believed that fully 90 per cent of the patrons of the lake beaches of the city are employed on week days until five o'clock or later and, therefore, if they wish to indulge in lake bathing on these days they must do so at about dusk or later. Many accidents have happened at night, some fatal, which probably could have been avoided if the beaches had been illuminated sufficiently for efficient rescue work. It has also been found that the cover of darkness provided opportunity for unseemly and improper conduct on the part of a certain element of the frequenters. As it was not possible to prohibit bathing after dark without depriving a very large number of the opportunity of indulging in this sport, plans were considered whereby the beaches could be made safe after dark.



Projector Installation at Bathing Beach.

One of the methods suggested was the illumination by means of powerful electric projecting lamps. This was tried out at the Clarendon Municipal Beach adjoining the city's Lake View Water Pumping Station. The method in which this was carried out is shown in the accompanying illustration. A battery of focusing arc lamps was mounted on top of the coal conveyor shaft of the pumping station. These lamps were so directed that they projected their light so as to illuminate the entire beach proper and a considerable area of the water. The lamps were equipped with deep parabolic reflectors. Constant-potential arc lamps, such as are used in stage projector work, were employed. The lamps were connected to a slate panel with inclosed fuses and knife switches that set near the center of the group for the purpose of control.

At night the entire beach was flooded with a soft light leaving no dark corners and there was practically no glare noticeable from any point on the sand beach or water due to the high mounting of the lamps. This also served to make the illumination quite uniform and eliminated the deep distorted shadows found with most methods of lighting with low hung lamps.

As regards energy expense, the cost is comparable with that of a more localized system of lighting employing numerous posts. It has the advantage of more uniform and better illumination and lower installation cost. Although the installation was of a temporary character, it was entirely successful, and it is believed that this method will be utilized at all of the public beaches next summer, and it is proposed that all of the private beaches be also compelled to provide similar equipment. It is possible, however, that gas-filled trungsten lamps will be used in place of arc lamps.

Outing of Vermont Association.

The annual convention of the Vermont Electrical Association took the form this year of an outing at Rutland, at the same time that the Rutland Fair and Carnival occurred, September 9 and 10. The members and guests were given the exclusive use of the roof garden of the New Bardwell Hotel.

AVOIDING BEING AT SALESMEN'S OR SOLICITORS' MERCY.

By Elton J. Buckley.[1]

A Pittsburgh firm write me that they are facing a very serious problem on which they wish some suggestion through these articles. They do not wish me to reproduce their letter, or to give their name, but I am permitted to state their problem in a general way.

They use a large number of salesmen and are practically depending on them for their business, which appears to be somewhat peculiar, in that very few of their customers ever come into the store. Almost all of their business, therefore, comes in through salesmen, and like many concerns, they are at their salesmen's mercy in a very large degree. I have known of other cases like this. In one of them a concern was practically destroyed over night by a strike of all of its salesmen. In the end it managed to gather something from the wreck, but the condition into which that house was plunged by the leaving of its salesmen was the greatest possible revelation of the danger any concern exposes itself to if it lets its trade go to its salesmen rather than to itself.

The Pittsburgh concern has had considerable trouble with salesmen leaving and joining a rival house in the same line of business. Naturally, their acquaintance with the trade was their chief asset, and they capitalized it all they could. Some efforts had been made by them in past cases to stop salesmen from doing this, but they had not been very successful, and the concern writes that there is some reason for believing that it is going to lose six of its best men, who are talking of forming a company of their own to go into the same business, with of course, if possible, the same customers. I am asked to say how a house dependent wholly or in part on its salesmen can tie those salesmen up so that they may not suddenly depart and take all the trade with them.

I can of course see the very great need of such protection, and I am glad to say to any one who is interested that the thing can be done, not completely, but to a very useful extent, by the right kind of a contract keeping salesmen off their old customers when they take a new place, or even when they engage in business for themselves.

The courts do not like these contracts, for they savor of restraint of

[1] *Copyright, 1915, by Elton J. Buckley.*

trade, but they will enforce them nevertheless if they are reasonable and properly drawn. I have never known one case, however, in which a salesman was compelled to stay away from his old customers, unless he had contracted to do so, preferably in writing. Let me make that emphatic. A salesman engages with a house to solicit new customers. There is no contract binding him not to solicit the firm's customers if he leaves. He works up a good list, being of course paid for his work. Receiving a better offer, he takes himself—and seeks to take his list—to a new employer. No matter how unfair that may seem, no matter how hurtful it may be to the old employer, the courts will not interfere, because the salesman never contracted not to do that very thing. It is only grudgingly, anyway, that the courts will interfere with a salesman in such a case, and all the conditions must be right before relief will be granted.

Which means not only that a contract must have been made, but that it must have been a reasonable contract. I heard a case argued recently, in which an appeal court, apparently with considerable satisfaction, threw a restraining contract of this sort out of court. It had been made by a big laundry concern with its solicitors, and bound them if they took another position, *never* to solicit their old customers for the new house. The employer had over-reached himself; the court said the contract was unreasonable. Had it bound the solicitors not to go after their customers for six months, or even for nine, it would almost certainly have been upheld.

In a case of this sort which happened recently in my own experience, I had some trouble to convince an employer that six months' protection was plenty. Certainly if a house cannot go in and bind its former salesmen's customers to itself in six months, it can never do it.

The point about a contract like this is that it must go no further than will give the employer proper protection. If it oversteps that line, it will be considered undue restraint of trade and will be thrown out. What will be proper protection varies in different cases. A physician selling his practice, which was all local, would not be held to a contract by which he bound himself not to practice medicine within ten miles for a certain period. Manifestly, the contract was unnecessarily wide. Of course where it is a case of a salesman, calling on certain trade, that part of it is easy—he is simply to keep away from any customers whom he called on for his old house. The period of exclusion is the mooted point then. It is not safe to make it longer than six or nine months, and three months is safer.

I will write here a brief form of agreement which will be upheld, I believe, in any court. The employer is party of the first part and the salesman party of the second:

The party of the second part, in consideration of the premises, and upon being given the said employment, hereby agrees in case he should leave the service of the party of the first part, not to approach, write to, telephone to or solicit in any manner whatever, direct or indirect, the customers of the party of the first part within a period of six months after said leaving.

Ordinary contracts with some salesmen would be unenforceable, because the salesman would be without resources. But you could enforce the above contract with an ***injunction,*** which would mean imprisonment for contempt of court if he violated it. A contract like this performs two good offices. It not only supplies protection after a salesman leaves, but it makes him much more settled in his position. If he realizes that he cannot capitalize his employer's customers, he will not be so attractive to his employer's rivals.

LETTER TO THE EDITOR.

Some Interesting and Important Law About Buying Goods.

To the Editor:

The article with this title in your publication of August 21, 1915, page 335, was of some interest to the writer in as much as he has had some experience with ordering goods by mail. The writer wishes to take issue with the decision rendered by Elton J. Buckley. While not an attorney or making claim to know many points in law, I wish to cite, first, that Mr. Buckley states that there must be an acceptance before there is a contract; further, "that the thing was done the minute you mailed your letter"; and further, "that the offer was under the law accepted the minute you posted your letter, the mail was regarded as the seller's messenger, not yours."

I agree with Mr. Buckley as to the first statement, viz., that there must be an acceptance before there is a contract. It is a well settled fact that it takes two to make a contract. Now then my contention is that, had Messrs. Morgan & Barnes availed themselves of Section No. 553 of the United States Postal Laws governing the recall of first-class matter, which provides that a letter belongs to and is the property of the sender until actually delivered to the addressee, they could have requested the post master at New York to telegraph the post master at Chicago, requesting the return of the letter to the post master at New York and its final return to the sender. Said firm then in that event would have never known of such an order being sent—hence no contract or acceptance, which would have saved said first firm some money. This provision of the postal laws therefore must refute the statements made by Mr. Buckley regarding the posting or sending of first-class matter.

Durand, Wis., August 24, 1915.

H. A. Miles.

Answer.—The Government regulation has no bearing upon contracts made between individuals by mail, and is not intended to. The rule referred to would not change the law of acceptance; it would simply keep the party addressed from knowing there was an acceptance. It would not alter the fact that there had been an acceptance, and if the party addressed ever found it out he could hold the other party absolutely. This is analogous to a case where *A* and *B* were negotiating together in a matter, and *A* sent a messenger to *B* with a definite offer. *B* wrote an acceptance and handed it to *A*'s messenger. At that minute the contract would ordinarily be complete. If *B*, repenting, ran after the messenger and snatched the acceptance out of his hand, or if he kidnapped the messenger and shipped him to Australia, the fact of the acceptance would remain, and as soon as *A* found it out he could act on it.—Elton J. Buckley.

Students' Camp in Touch with World by Wireless.

Technology Camp, a summer school of students of the Massachusetts Institute of Technology, in the Maine woods, has been in touch with the news of the outside world by means of two wireless receiving outfits, which receive wireless impulses from the same sources that the newspapers and news associations rely upon.

One receiving set was loaned to the students by the Government, and is located in a tent. The second outfit is of students' construction, and has two antennas, which are attached to a flag pole. The ground connection is by a galvanized-iron pail, loaded with stones and sunk in the lake, the copper wires being wound around the pail.

The students are engaged in practical surveying and hydraulic measurement, the latter on a commercial scale. The camp is located on Gardner Lake, East Machias, eight miles from the nearest village.

New Electrical and Mechanical Appliances

New Plug Cap for Armored Cord or Cable.

In all industrial plants there is a rapidly increasing use of armored cord and cable for the connection of portable electric tools, trouble lamps, etc. This has caused a demand for a cap on the plug which can be readily connected to the metal armor of the cord.

A cap meeting these requirements has been placed on the market by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn. In this cap a brass ring swivels around a specially formed composition bushing, thus securely gripping the metal covering of the cable or cord and making knotting of the wires unnecessary to eliminate any strain on the conducting wires themselves.

This plug is made in two types; No. 6328, which is shown below, is equipped with the standard contacts; No. 6329 has the small type contacts. Both of these are interchangeable with the entire line of Hubbell T-slot wall and flush receptacles. These caps are suitable for all of the common makes of armored cord and cable. They have been found highly advantageous in industrial plants as means of connecting portable machines and tools without danger of short-circuiting the lead wires where they connect into the plug.

Plug Cap for Armored Cord.

Railroads Increase Telephone Dispatching Facilities.

The Illinois Central and Atlanta & West Point railroads are planning to add additional equipment to their telephone train-dispatching facilities. The plans of the Illinois Central call for ten complete station sets, in addition to the fifty which it has had in service since January.

The plans of the Atlanta & West Point Railroad call for 13 complete stations, which will be added to the 30 the company has had in operation for some time. The equipment in both cases will be furnished by the Western Electric Company.

Insulated Screw-Driver.

For use around electrical machinery, particularly of the low-voltage type, mechanics are liable to be careless with the use of tools, thus frequently short-circuiting parts of the equipment or causing other damage. To meet this contingency there has been placed on the market a new insulated screw-driver in which the handle is made of rubber insulating compound and is all in one piece, as shown in the illustration. The screw-driver has a steel blade of high quality which is six inches long. The stem of this is completely imbedded in the insulating compound forming the handle, which has a good grip. There is no shoulder or obstruction between the blade and handle. The full length of this tool is 11.25 inches.

Insulated Screw-Driver.

This tool is known as rubber-covered screw-driver No. 613, and is made by H. D. Smith & Company, Plantsville, Conn.

Chelten Cord Connector.

The Chelten Electric Company, Philadelphia, Pa., is placing upon the market an additional specialty made from non-breakable composition. The company is at present manufacturing a push-button switch, a receptacle and an attachment plug made of this material, and the new addition is in the way of a cord connector.

This connector is small, neat and compact, and is so designed that it can be readily adjusted. Contacts are strong and heavy, and will allow for an unusual overload. The cap used in connection with the connector is interchangeable with the Chelten receptacle and attachment plug.

Composition Cord Connector.

Electric Steam-Tables for Lunch Counters and Restaurants.

Where commercial electric ranges are used for cooking, or even where cooking is done by other means, the electric steam table should prove a good business-getter for central stations.

S. A. Hoag, commercial agent for the Puget Sound Traction, Light & Power Company, at Everett, Wash., states that recently, while figuring with

a prospective customer on the installation of an electric range in his restaurant, the customer desired to eliminate gas entirely, so a steam table was designed to meet the conditions. The operation was so satisfactory that subsequently other restaurants were induced to install them, and the low cost of operation has in each case justified the installation.

A standard gas-operated steam table may easily be changed over for electric operation by suitably insulating the walls and bottom with 1.5 inches of asbestos felt and by installing immersion heaters. The immersion heater used is a Westinghouse eight-inch disk type with two-heat regulation, 1,100-275 watts. The shape and thinness of this particular heater allow it to be used in the narrow water space available between the bottom of the tank and the earthenware food-containers.

In operating this electric table, it is advisable to fill it with warm water at the start, as in this case the three heaters may be used at low heat and the maximum demand on the table reduced to 825 watts, which permits it to be operated on the average central station's power schedule. After the temperature of the water reaches 180 to 200 degrees two heaters may be turned off, as one unit will maintain a sufficient temperature for all ordinary conditions. Operated in this way for twelve hours per day the current consumption is about 7 kilowatt-hours and the daily load factor about 35 per cent, making it very desirable business for central stations.

Automatically Controlled Electric Oven for Testing Shrapnel.

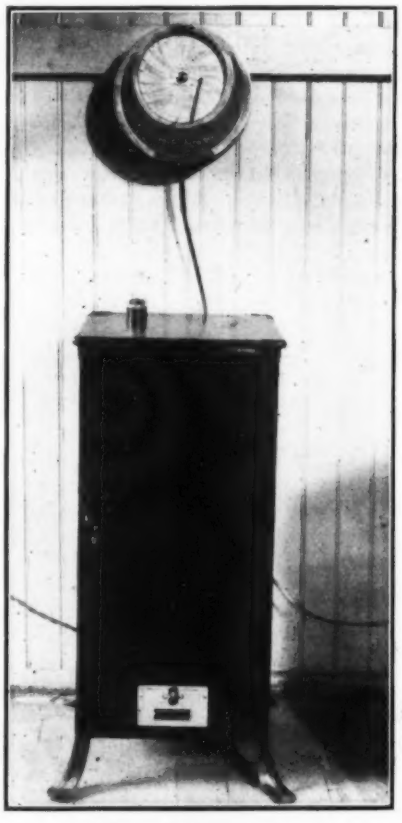
Among the many varied applications of electricity constantly being brought before the public, and one of the most interesting at this time in view of the conflict now raging among the leading nations of Europe, is an automatic thermostatic controlled electric oven manufactured by the Hughes Electric Heating Company of Chicago, Ill.

This oven is for use in one of the government arsenals in Pennsylvania for the testing of shrapnel shells. In the testing of these shells it is necessary that a temperature of 120 degrees Fahrenheit be maintained continuously for 24 hours. This control of temperature is obtained by means of a compact type of thermostat which makes and breaks the heating circuit. One contact point is carried by the expansion member of the device and the other is adjustable by means of a thumb screw which extends outside the case. A condenser across the contact points holds the arcing down to practically nothing.

The oven is fitted with a mercurial thermometer for indicating the temperature. It is also fitted with a pilot lamp, connected in parallel with the heating element, to indicate when the current is on and off. On a continuous test for 24 hours, the temperature of the oven did not vary more than one degree. This temperature reading is shown on the recording thermometer just above the oven, in the accompanying illustration.

The oven is of especially rugged construction and is designed to withstand hard usage. The heating element is of the familiar type as used in all Hughes ranges, and is rated at 200 watts.

Electric ovens have been found to be superior to any other method on account of the perfect heat distribution and the limited space occupied. They can be used for a number of purposes, such as enameling, baking cores, drying, etc.



Shrapnel-Testing Oven.

Hotpoint Electric Vacuum Cleaner.

For many years the Hotpoint Electric Heating Company, Ontario, Cal., has been noted as one of the leading manufacturers of electric heating appliances. Its product has been steadily extended so as to include practically all types of electric heating devices, principally for use in the home. Broadening this policy of specializing in household electrical utilities so as to include other than heating devices, the company has just placed on the market a new type of vacuum cleaner, which is said to have several distinctive features and improvements.

The new cleaner has an air-cooled motor, which keeps it at the proper temperature and eliminates lubricating troubles. The suction shoe is an inch wider than similar models of this type. The cleaner is made of aluminum and nickeled steel, which makes it very light in weight; the complete weight is only 9 pounds. It also has a pistol-grip handle, making it convenient to manipulate; a locking device is provided on the handle so as to permit locking the appliance in an upright position. A push-button switch on the handle makes it convenient to control the motor. This cleaner has rubber-tired wheels and the rear roller is adjustable so as to keep the nozzle at a proper distance from the nap of the carpet. The outfit can be operated from ordinary lighting circuits of either direct current or alternating current. The power consumption is from 200 to 240 watts.

Hotpoint Vacuum Cleaner.

In order to further increase the utility of this appliance seven attachments are supplied at a slight additional cost; these consist of a nickel-plated tube, connecting hose, attachment for cleaning radiators or other narrow spaces, blowing attachment, connection between hose and cleaner, brush for cleaning clothes, and nozzle tool for cleaning walls, curtains, etc.

Telephone Equipment for Churches.

A new type of telephone apparatus known as "church telephone equipment" has made its appearance on the market. It will be most useful in churches, lecture halls, and theaters where the acoustic properties are poor, or where there are among the audience men and women whose hearing is not normal.

The equipment, which has been developed by the Western Electric Company, consists of a special telephone transmitter for mounting on the pulpit or platform and receivers to be used by those in the audience requiring them. The transmitter consists of three special microphone transmitter units in an ebony-finished case. The receiver is the ordinary watch-case type with a lorgnette handle provided with a special sliding extension to vary its length from four to seven inches. This receiver is convenient to use; it may be held to the ear for any length of time without fatigue.

Each receiver is provided with a cord and plug. A jack, which is connected to the line leading to the transmitter,

Transmitters and Receiver for Churches and Lecture Halls.

is placed in the pews. When the plug attached to the receiver is inserted in the jack, the user is in a position to listen via telephone to everything that transpires on the pulpit or stage, no matter where he or she may be sitting.

Although the apparatus has been designated "church telephone equipment," it can be used equally as well in theater or lecture hall. There is no doubt but that the system will prove a boon to the church-goer whose hearing is defective or whose pew is in a far corner of an edifice with poor acoustic properties.

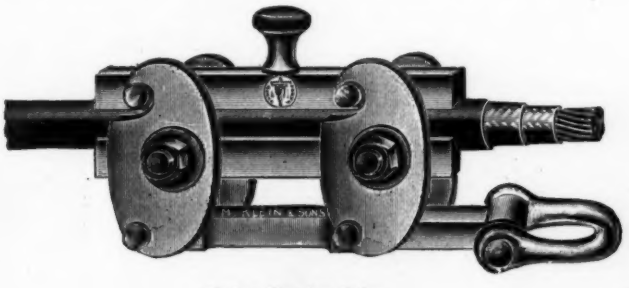
New Grip for Stringing Heavy Cables.

A new grip, known as the Maine Feeder Grip, capable of handling cable from 250,000 to 500,000 circular mils, and obviating the old chain-and-ring method, has just been produced and is now being marketed by Mathias Klein & Sons, tool manufacturers, Chicago, Ill.

This grip is said to solve a troublesome problem in the stringing of large-size cables. It fills the demand for a grip to handle the larger transmission lines which heretofore was done in a more or less cumbersome manner and often with injury by the old chain-and-ring method.

The grip is said to be a radical innovation in the field. The manufacturers claim it is exceedingly rapid in application and release and automatic in action. The grip hold is in direct ratio to the pull exerted. In a recent test in the field by a large operating company 19,500 feet of 500,000 circular-mil insulated feeder cable was pulled in place without the slightest slippage, marring or damage to the insulation.

The Maine feeder grip is also suited to handling lead-covered cable, it is stated, as well as steel messenger wire without injury to either. It is made



Maine Feeder Grip.

in two sizes, one for five-eighth-inch strand and the other for cables of 250,000 to 500,000 circular mils.

The main body construction is of substantial steel casting. Pivoted side plates control the action of the upper and lower jaw. The upper jaw is removable to facilitate application of the cable. It is simply necessary to disengage lugs from notches in the side plates to remove the upper jaw before or after using the grip.

New Electric Washer.

Realizing the demand for a high-grade thoroughly reliable electric washing machine that can be retailed at a price within the reach of the average home, the Boss Washing Machine Company, Cincinnati, O., is offering its well known "Champion" washer equipped with motor drive. It is said that the Champion as a hand-operated machine has been known among housewives for over 30 years and the addition of the motor drive will meet with popular favor among its old friends, as well as meet a long felt want for a first-class moderate-priced electric washer.

The "Champion" electric washer is furnished complete with a Fort Wayne type motor, as illustrated, and is ready for use by screwing the attachment plug into the nearest electric light socket. It needs no attention whatever while running and is claimed to be absolutely troubleproof, but in case of emergency it can be operated by hand by simply attaching a wheel handle furnished with each machine. The Champion electric has every desirable feature, such as metal drain faucet with hose connection, rollers on the legs, self-adjustment cylinder, which makes it possible to wash a large or small batch of clothes at a time, and one of its distinctive features is that the use of the motor is not limited to operating the washer only—it can be used to operate a churn, ice-cream freezer, or any small household appliance adapted for the purpose. It is claimed that the mechanism is extremely simple, having no gears or breakable parts, and it is practically noiseless in operation. Two sizes are made, No. 2 for regular family use, and No. 3 for large families, hotels and laundries.

New Washer.

Gas From Peat.

The municipal gas works at Akkrum, Holland, is extracting gas from peat mixed with coal. It is stated that if peat alone were used, the retorts would become too hot, because of the steam created by the moisture always found in peat. Accordingly the retorts are filled with two parts in weight of coal to one part of peat. The peat—as well as the coal—produces about 30 cubic meters of gas per 100 kilos (220.46 pounds). The gas produced from this mixture is declared to be of excellent quality. The peat is entirely consumed in the process.

Improved Head-End Axle Generating System for Train Lighting.

Ever since it became certain that electricity was to be the coming illuminant for railway train lighting as well as for general purposes, the method of its economical and efficient application has been an important problem to steam-railway companies and officials. One of the first results of Edison's development of the incandescent lamp was the application of it to train lighting. Curiously enough the English first made this attempt, in 1881, and the dynamo was placed in baggage car and driven from car axle.

In the intervening years much study has been given the problem and several systems of supplying electricity to the cars have been evolved and put into use. The simplest was the straight-storage system, each car being supplied with a storage battery fully charged prior to the trip. The head-end system came into extensive vogue; in this a dynamo in the baggage car is driven by an engine or turbine supplied with steam from the locomotive. The axle-driven car-lighting sets having an independent generator, storage battery and regulating equipment on each car have also been extensively used. Each of these three systems has its adherents and the two latter systems are most commonly employed on American steam railroads.

Some six years ago trials were begun on the Northern Pacific Railroad of what might be termed a combination of the two most common systems, that is, a single axle-driven set at the head end of the train, or a reversion to the original English attempt referred to above. It was believed that this system had many advantages, if it could be perfected so as to supply all the current needed by the most modern heavy passenger trains, such as are run on the transcontinental lines.

After several years of experimentation, three trains were equipped in 1912 with four-kilowatt, 80-volt, Safety axle generator sets. In the following year seven additional trains were equipped with four-kilowatt axle generator equipments, these being of the Gould Simplex type. These 10 four-kilowatt equipments are still in regular service lighting four-car trains and giving excellent results. In 1914 a 20-kilowatt set was provided and last June two 17.5-kilowatt equipments were installed on the heavier through trains.

Each of these three latest machines is operated through two five-inch Morse Silent Chain drives, one of which runs horizontally from a sprocket on the forward car axle to a jack shaft supported by the steel structure holding the generator. The other chain runs vertically from the jack-shaft sprocket to the generator shaft, as shown at the right in Fig. 1. These chains can be readily inspected. One set of chains ran for 140,000 miles before it was necessary to remove it for repinning, after which it was practically as good as new. The generator-supporting structure consists of a cast-steel base bolted to the front end and center sills of the truck; on top of this is a cast-steel pedestal which serves as a platform on which the generator is bolted. As shown in Fig. 1, this platform stands over a foot above the floor of the baggage car. The open space shown between the platform and floor is usually closed by a flexible canvas gasket to exclude cold air, dust and water. The generator is inclosed by a hinged steel casing. The jack shaft has roller bearings and the generator shaft ball bearings. Considering the rigid mounting of the generator on the truck, it runs surprisingly well and quite free from noise and vibration even at high speed and load. The generator is of Ridgway make and is a six-pole, compound, commutating-pole machine. It operates on the train circuit between the limits of 300 and 2,100 revolutions per minute (corresponding to train speeds over 12 miles per hour), being connected thereto by an automatic switch when the voltage reaches 66 volts.

The electrical control and regulating system at first sight seems to be somewhat complicated, but in general principles is quite simple. When the train is not in motion and the generator is therefore idle, current for lighting or other load is supplied from three lead storage batteries of 32 cells each, located under the baggage or dynamo car, under the middle car, and under the rear car of the train; occasionally the middle battery is omitted. The generator control includes an automatic switch for connecting in the machine properly after its voltage has increased to be above that of the battery; there is also a generator current and voltage regulator to keep the maximum current output below a certain adjustable value and to keep the voltage slightly above the increasing voltage of the batteries as they are charged until a maximum of about 83 volts is reached. This provides a gradually tapering or decreasing current as the point of full charge is reached and protects the batteries from excessive overcharge.

For connecting the dynamo car to the other cars of the train a three-wire train line is used. This consists really of two two-wire circuits with a common return wire. The dynamo and the two or three storage batteries are connected across one circuit, while the lamps or other load are connected across the other circuit. Each circuit can therefore be regulated independently. Regulation of the generator

Fig. 1.—Mounting of Axle-Driven Generator Above and Free From Floor.

Fig. 2.—Instrument, Switch and Regulator Panels in Baggage Car Near Covered Generator.

charging circuit has already been referred to. The lamp regulator, which is really in two parts, is used to keep the voltage of the lamp circuit very close to 66 volts. Thus while the batteries are being charged it must absorb the difference between the generator voltage, which may be as high as 83 volts, and the proper lamp voltage of 66.

Without going into the details of the regulation and control equipment, it may be said that it operates very satisfactorily. Fig. 2 shows this part of the apparatus. As installed in the latest sets the arrangement is somewhat different. Included in this regulating equipment are one or more resistances to compensate for the different positions of the batteries. This resistance protects the forward battery from getting higher charging voltage and from discharging at a higher rate than the rear battery and thus overcomes the drop in potential in the train line against which the rear battery has to contend.

So far as the general public is particularly concerned, the special advantages of this system of train lighting are the availability of the current at all times and the consequent stable and uniform lighting of the cars whether standing still or in motion. As for the railway companies, the economy and efficiency of operation appeals strongly to them in addition to the preceding reasons.

New Diehl Polyphase Squirrel-Cage Motors.

The Diehl Manufacturing Company, Elizabeth, N. J., has just completed and placed on the market an entirely new line of polyphase induction motors of the squirrel-cage type. These, it is claimed, have structural, electrical and patented ventilating features which make this line highly desirable.

The yoke itself, as shown in Fig. 1, is of the "skeleton" type and cast from gray iron. It is carefully proportioned to provide advantageously for the ventilating plan which will be mentioned later. Due consideration is given to strength and rigidity of construction. The end bonnets are of the same material as the yoke and designed with equal care for ample ventilation, strength and rigidity. It will be noted that they are of mill-type construction, thus protecting the stator windings and precluding casual injury from external sources. The end bonnets are interchangeable and are so drilled in relation to the yoke as to permit of rotation, thus providing for wall, ceiling and floor mounting.

Bearings are comparatively large in proportion, purposely so designed to give a minimum bearing pressure. They are interchangeable end for end, and are in every case provided with ring oilers of large diameter, thus insuring a low rotative speed of the ring and preventing churning and throwing of the oil. The oil well is so made as to give ample space for the rotation of the oil ring which is held in place in a manner precluding the possibility of its failure to rotate. The bearings are dustproof by virtue of carefully designed oil-hole covers, oil-vent covers and a medallion cap provided on the front bearing housing. The usual drain

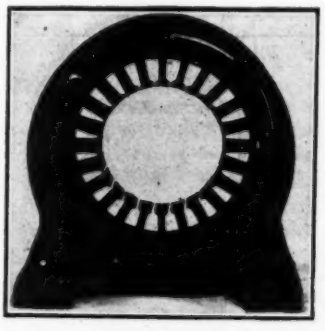


Fig. 1.—Yoke and Stator Core of Motor.

plug is provided at the bottom of the oil wells.

The stator and rotor cores are built up of annealed laminations of a special grade of electrical sheet steel purposely selected as having the desired characteristics to insure minimum iron losses. The assembly of the laminations is secured by heavy cast iron for the stator, or steel for the rotor end plates, all parts being carefully keyed to the yoke housing and shaft, respectively.

All shafts are made from a special grade of mild steel carefully ground to gauge size at the bearing surfaces and rotor punching seat. There is provided on each end a liberal oil sling turned integral with the shaft. The shafts are universally interchangeable between motors of the same frame sizes.

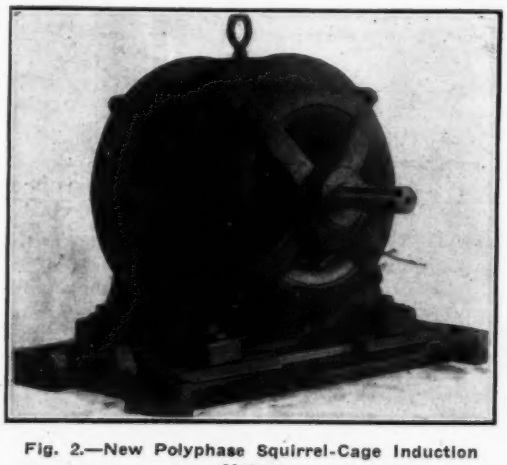


Fig. 2.—New Polyphase Squirrel-Cage Induction Motor.

The stator windings are first partially formed and shaped and then inserted into the heavy insulated semi-inclosed stator slots. This applies to all motors up to 20 horsepower, inclusive. For sizes above 20 horsepower open slots have been adopted, permitting the use of a coil completely formed, insulated and impregnated prior to placing in the slots. Slots are provided with the best grade of insulation and submitted to a standard high-voltage test which in every case is equal to or exceeds the standardization requirements of the American Institute of Electrical Engineers. The finished stator is finally subject to two dippings and bakings in an insulating compound of proper grade to insure a thorough impregnation and sealing of the windings.

The rotor winding is of the regular squirrel-cage type. That portion of the winding which goes into the rotor's partially closed slots consists of round copper bars. These rotor bars are provided with a shoulder on the projecting end, the tip being carefully turned to size so that a close fit is insured in the end rings. These are pressed onto the projecting tips of the rotor bars. The tips are then headed over, forming a regular rivet head. Thus, during the operation of heading over the tips the body of the tip expands, insuring an absolutely tight fit and perfect electrical connection to the end rings. After this riveting process is completed the entire mass is dipped into hot solder of a very high melting point which penetrates all recesses, completely covering the end rings and ends of the rotor bars, preserving the electrical contacts from any possibility of corrosion.

Riveted to each end of the rotor core are ventilating blades which maintain a continuous flow of air drawn in through the end-bonnet openings, passing first over the lower, then over the upper sides of the coils, and finally over the exposed portions of the stator core, being ejected through the openings in the yoke. The ventilating scheme is a patented feature and the manufacturer claims that positive directive ventilation is the result.

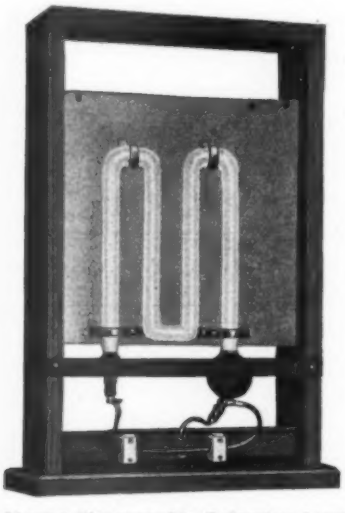
Each three-phase motor is provided with six leads and each two-phase motor with four leads, each of which is brought out through a heavy pressed-steel terminal box. Soft-rubber insulating bushings are provided for each lead. The standard tray provided is suitable for floor, wall or ceiling mounting and when used for floor mounting has the oil-drip tray feature.

Mercury-Vapor M-Shaped Photographic Enlarging Outfit.

Photography, like every other industry or trade, has made tremendous advances in recent years due to the demand for high-grade work. Especially has this been the case with enlargement of photographic negatives which require special lighting facilities for producing the best results. What is required is a steady light without flicker or variation and one that could be used without condensing lenses or other diffusing media. An illuminant was also required that had a long life and did not require constant care and attention.

For enlarging purposes the illuminant must bring out the roundness and the atmosphere of the negative without accentuating any of the retouching or coarseness that would detract from the finished picture.

This ideal has been practically realized for some time past with the use of one



M-Shaped Photographic Enlarging Lamp.

or more twenty-inch mercury-vapor tubes. This arrangement gave the desired quality and quantity of light, but it was found that the efficiency would be very materially increased if it could be arranged to concentrate the maximum amount of light directly behind the negative.

Realizing this fact, the Cooper Hewitt Electric Company, Hoboken, N. J., has brought out the M-shaped outfit illustrated herewith, which accomplishes the desired object in a very simple manner. So called from its similarity in shape to the letter M, this outfit consists of a 50-inch tube bent at six points as shown. The tube in this shape gives a strong even field with two sheets of ground glass which can be placed within 3.5 inches of the tube and within one-half inch of the negative. The outfit can be furnished for either direct-current or alternating-current circuits, and may be mounted on a stand, as one of the illustrations shows.

A number of these devices are in use by photographers who claim that they are able to obtain excellent enlargements in considerably less time than with other light sources. Among the particular advantages claimed by those using this outfit are that it affords an even distribution and a steady glow of purple rays, whereas the arc lamp has to be adjusted at frequent intervals, and that there is an absence of glare often observed from a single incandescent source.

Test on Pole Guy Anchors at Cleveland.

The Faultless Anchor Company, Fostoria, O., recently made a test of its anchors in Cleveland, O. The test was witnessed by a large number of representative electrical men, including Messrs. McCarty, superintendent of construction, and Spangler, inspector of pole-line construction, Cleveland Bell Telephone Company; Messrs. Sharp,

Photographic Lamp on Stand.

superintendent of construction, and Richardson, pole-line supervisor, Western Union Telegraph Company; Mr. Burgess, superintendent of overhead construction, Cleveland Illuminating Company, and Mr. Pearson, foreman of construction, Ohio State Telephone Company. The object of the test was to obtain data bearing upon the holding strain of mechanical anchors, and, second, to determine the ultimate or necessary strain required to break or pull the anchor from the ground.

The load was applied to the anchors by connecting them through a dynamometer, with a double set of large blocks and a heavy-duty chain fall to a heavily guyed pole of normal height. A substantial initial strain was first applied and a mark made on the anchor rod to indicate its initial position. The creeping of the rod was measured from this initial mark. The load was added in increments of from 500 to 1,500 pounds. Measurements for creep were made between each loading. An interval of five minutes without pull was allowed between each load.

The results on the "Faultless" anchors were as follows:

Test 1.—One-half-inch rod, two-blade, 16-inch-spread anchor. Held without creep at 5,500 pounds. This anchor made a very remarkable showing in that the next load added pulled its rod apart at 6,600 pounds.

Test 2.—Five-eighth-inch rod, two-blade, 18-inch-spread anchor. Held without creep at 4,800 pounds, when one blade broke, due to a flaw in casting. The capacity of this anchor is said to be about 9,000 pounds.

Test 3.—Three-quarter-inch rod, three-blade, 18-inch-spread anchor. Held without creep at 12,800 pounds. The blades of this anchor bent down at 13,200 pounds.

Test 4.—One-inch rod, four-blade, 24-inch-spread anchor. Blades bent down at 15,200 pounds without creep. This anchor is a late addition to the line, intended to hold without creep at 16,000 pounds, for dead-end and cable-strain service. This is said to be the first test of this very large anchor, and proved quite conclusively that more metal is required in the fins. This change is being made.

The basic principle of this new anchor is considerably different from that of other anchors on the market. It depends primarily upon virgin or undisturbed earth to hold it in the ground. The very large holding surface which it presents to undisturbed soil eliminates tendency to creep. This anchor may be installed in virgin soil in a very short time.

New Portland Quarters for Western Electric Company.

Expansive business growth has caused the Western Electric Company to give up its old local quarters at Portland, Ore. Since 1910 the company has been located on Fifth Street, but has now moved into a new two-story brick and concrete building, which has been made ready for it at East Ash and Union Streets. The building has efficiently designed shipping, receiving and warehousing facilities, and is one of the most modern of its kind in the Northwest. It has been planned to facilitate the quick handling of large stocks, which will insure first-class service.

A royal decree of May 20, 1915, institutes a municipal tax for the city of Tripoli in Africa of $0.0077 a kilowatt-hour on electric energy consumed for lighting, heating, or ventilation. This is 5.7 per cent on the present cost of $0.135 a kilowatt-hour. Power used for motors is exempt.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTOMATIC PHOTOGRAPHING MACHINE.—United Vending Machine Company, 840 East Ninety-third Street, Cleveland, O., submittor. Manufactured by General Electric Company, Pittsfield, Mass.

Device is a coin-operated machine, contained in a steel cabinet equipped with an arc lamp for automatically making small tintypes. In operation of device a coin-switch is used to complete circuit of small operating motor, which runs for one minute actuating mechanism, and which controls knife switch in arc-lamp circuit. 125 volts, alternating current or direct current, 15 amperes.

Standard when connected by standard fittings to wiring circuits of suitable capacity for current required, but not for connection to ordinary lighting circuits, nor to ordinary lamp sockets or receptacles.

Listed August 11, 1915.

CABINETS.—Aurora Steel Products Company, Aurora, Ill.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed August 7, 1915.

COIN-OPERATED MUSICAL INSTRUMENTS.—Almy Manufacturing Company, 60 West Kinzie Street, Chicago, Ill.

Automatic cashier and discount machine, consisting of a coin-operated automatic musical instrument with mechanism for displaying photographs, all inclosed in a wood and glass case. An automatic inclosed switching mechanism controls the circuits of a number of incandescent lamps which illuminate interior of instrument while operating.

Listed August 19, 1915.

FIXTURES.—Trenaman Electric Dental Manufacturing Company, Incorporated, 220 Fifth Avenue, New York, N. Y.

Adjustable electric light fixture for dentists' offices, consisting of a fixture supported by a special cable passing over pulleys on a frame, with counterweight, junction box, switch and supply cord. The special cable consists of two National Electrical Code flexible conductors, a steel runner and tie cord for support of fixture, an outer padding of cotton threads and two braids.

Listed August 18, 1915.

OUTLET BUSHINGS.—S. R. Manufacturing Company, 327 Dean Street, Providence, R. I.

A brass plate, with drilled hole for soldered connection of ground wire, threads on end of rigid conduit and supports a porcelain cap with three outlets for conductors.

S. R. grounding cap, one-half to one and one-fourth inch sizes.

Listed August 19, 1915.

PANELBOARDS.—The Mountain Electric Company, 1619-23 Glenarm Street, Denver, Colo.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed August 11, 1915.

PICTURE MACHINES AND APPLIANCES.—Atlas Educational Film Company, 5 South Wabash Avenue, Chicago, Ill.

Arc-lamp attachment. This device, for use with the Atlas special portable hand-operated picture machine, consists of an arc lamp, resistance units and lamp house mounted on a metal bracket and provided with a portable cord and plug for connecting lamp to supply circuit; 6 amperes, 110 volts.

Standard for use with slow-burning films only.

Listed August 16, 1915.

PICTURE MACHINES AND APPLIANCES.—Electric Products Company, 1069 East 152nd Street, Cleveland, O.

Watton-Rexolux, consisting of a vertical motor-generator and a panel with switches and cutouts.

Types M, MA, MM, MMA, for one, two and three-phase circuits, 35, 50 and 70 amperes direct current.

Listed August 19, 1915.

RECEPTACLES, for Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant and Perkins flush type.

25 amperes, 250 volts, catalog Nos. 446, 447, 448.

Listed August 10, 1915.

RECEPTACLES, Standard.—Best Electric Company, Pittsburgh, Pa.

"Best" composition-shell receptacles.

Keyless, 660 watts, 250 volts, sign type, catalog No. 2500.

Listed August 12, 1915.

RHEOSTATS.—Western Electric Company, 463 West Street, New York City.

Motor starters, types CR-1000, 1001, 1002, 1007, 1022, 1025, 1027, 2301, 2303; and (panels) CR-1100, 1102, 2201-2206 inclusive, 2320.

Speed controllers, types CR-1200, 1220, 1221, 1224, 1225, 1240-1245 inclusive, 1314; (panels) CR-1300, 1303, 1310, 1311, 1315, 1320, 1321, 1324, 1325 and (for printing presses) 6010, 6011, 6032, 6033, 6050, 6052, 6103, 6106, 6220.

Field rheostats, types CR-1226, 1227, 1228, 8000, 8001, 8100, 8132, 8192, 8322, 8390.

Theater dimmers, types CR-9301, 9302, 9303, 9304, 9311, 9312, 9313, 9314, 9321, 9322, 9323, 9324, 9331, 9332, 9333, 9334.

Battery-charging rheostats, types CR-9200, 9202, 9204.

Resistance units, types CR-9000, 9010, 9142, 9143, 9144, 9145.

Drum controllers (for industrial service), types CR-3100, 3105, 3110, 3133, 3134, 3136, 3202; (without primary oil-switch attachment) 3204, 3900; also type K (for non-grounded circuits).

Motor starters and speed controllers, types CR-1000, 1001, 1100, 1200, 1220, 1221, 1225, 1240-1245 inclusive, are standard only when circuit-breakers or fuses are installed in connection with them. (See National Electrical Code. Rule 78*g*.)

Drum controllers are standard when properly installed in connection with resistance elements.

Listed August 2, 1915.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. porcelain-shell sockets.

Keyless, 1,500 watts, 600 volts, catalog Nos. 528, 529 and 530, with special metal inclosing bodies and attached eight-inch shade holders.

When used with with gas-filled lamps, these devices must not be used in show windows or in other locations where inflammable material is liable to come in contact with lamp equipment, and must, if within buildings, be connected to circuit with conductors of standard slow-burning or asbestos covering.

Listed August 11, 1915.

TRANSFORMERS.—The States Company, 19 New Park Avenue, Hartford, Conn.

Air-cooled autotransformer for indoor use.

275 volt-amperes. Primary voltage 110, secondary voltage 55. Catalog No. 14,001.

550 volt-amperes. Primary voltage 220, secondary voltage 55 and 110. Catalog No. 14,011.

Standard only when installed and wired in both primary and secondary circuits in accordance with rules for Class C wiring of National Electrical Code.

Listed August 20, 1915.

WIRES, Weatherproof.—Monarch Electric & Wire Company, 624 West Adams Street, Chicago, Ill.

Standard.

Listed August 2, 1915.

Current Electrical News

ATLANTIC STATES.

GOWANDA, N. Y.—The Gowanda Light and Power Company has purchased the Keyes Electric Company, and has begun active work in improving the lighting system at Gowanda. Plans for a new power house to be constructed are now being made.

SOUTH BETHLEHEM, PA.—The L. P. Lipshutz Cigar Company, of Philadelphia, will erect a large four-story cigar factory here in the near future. It is reported that electricity will be used for the motive power throughout the plant.

CARBONDALE, PA. — The Board of Education is having plans prepared for a new brick, stone and concrete high school building to cost $100,000. E. H. Davis, of Scranton, Pa., is the architect.

TARENTUM, PA. — The expenditure of $21,000 has been authorized for improvements to the municipal electric plant. Sidney B. Martin, of Pittsburgh, Pa., will have charge of the work.

AYDEN, N. C.—A $15,000 electric light plant will be installed. Address the town clerk.

GEER, S. C.—The council plans to expend $10,000 to extend the lighting system. Address the mayor.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Court Street Welfare Association, an organization of business men, intends to use its influence in securing the extension to that street of a boulevard lighting system to replace the present old-style street lights. L. M. Sims is the president. L.

DAYTON, O.—Part of the equipment of the new Miami Hotel, for which contracts are being let, will be a large electric sign on the roof, bearing the name of the hotel in letters nine feet high, visible for some miles. W. Hall is furnishing the electrical equipment for the hotel, and can give information regarding the sign. L.

DAYTON, O.—The Dayton Power & Light Company has secured franchises and street-lighting contracts in the villages of Spring Valley and Bellbrook, and expects to furnish service to these villages some time previous to the end of the present year.

MASSILLON, O. — H. Whitford Jones, of Cleveland, has prepared plans for a new street-lighting system to be installed by the Massillon Electric & Gas Company, which has been tentatively approved by members of the council's light committee. The plans provide for an ornamental lighting system for the business district, and for a total of 1,121 street lights for the city. T. O. Kennedy, general manager of the light company, has charge of the matter for the company. L.

OSTRANDER, O.—J. C. Maugans, who recently completed the construction of a large garage and repair shop, intends extending electric service from the generating plant used in connection with the shop to the whole village, and is planning a distributing system for that purpose. Street lights will probably be installed. L.

SPRINGFIELD, ILL.—The sum of $15,000 will be expended for improving the light system. Address secretary of Local Board of Improvements.

LAKEFIELD, MINN.—The sum of $27,000 will be expended in rebuilding the light and water systems.

MINNESOTA FALLS, MINN. — The Minnesota Valley Power Company will make some extensive improvements on its plant at Minnesota Falls. A new and larger plant will be installed. Estimated cost of improvements is $20,000.

STRANDQUIST, MINN. — G. P. Janson is interested in the installing of new electric lighting system.

PERRY, IOWA.—The Iowa Railway & Light Company will make extensive improvements in the way of a modern power plant to be located in Perry and to supply current for surrounding towns. Work will probably be commenced on the new plant in a short time. Address Colonel Dows, of Cedar Rapids, president and general manager.

SPRINGFIELD, MO. — The present contract for city lighting is not satisfactory. A municipal plant may be established. Address J. H. Rathbone, chairman of lighting committee.

ATTICA, KANS.—Bonds amounting to $30,000 have been voted to install a new water works and electric light plant. Address the city clerk.

SOUTH CENTRAL STATES.

HAWESVILLE, KY.—The Water & Light Company has been incorporated with $12,000 capital stock by W. H. Williams, Nellie L. Williams and Charles C. Williams.

PROVIDENCE, KY. — This city will vote in November on a bond issue for the purpose of building an electric light plant. The amount of the proposed issue is $20,000. The Providence Electric Light Company, which is now operating, has no franchise, and has offered to sell its plant to the city for $5,000.

COPPERHILL, TENN. — M. C. King and others are planning the establishment of an electric light plant at Madisonville, Tenn. A franchise has already been granted at Madisonville.

HENDERSON, TENN.—This city which recently voted a bond issue of $13,000 for the purpose of building an electric light plant, will ask bids on the construction work shortly. J. L. Galbraith is mayor.

WHITE CASTLE, LA.—A special election on a $25,000 debt for the purpose of erecting a new water works system and electric light plant, carried. Work is to begin at once on the new project.

GROVE, OKLA. — Extensions will be made to the electric light plant in this city. Address W. H. Davis, city clerk.

HIGHLAND PARK, TEX.—Bonds amounting to $10,000 have been voted for the installation of an ornamental lighting system. Address the mayor.

KYLE, TEX.—The Excello Storage Battery Company, of San Marcos, is arranging to install an electric light plant in this city. Address W. W. Giesen, secretary of the company.

WESTERN STATES.

BOZEMAN, MONT.—Reported that City Council has rejected all bids submitted for the installation of an ornamental lighting system and that same will be installed by the city, work to be handled by the city engineering department. C. A. Speith is the city clerk. O.

BUTTE, MONT. — Park, Main, Broadway, Dakota, Montana, Arizona and Wyoming Streets are included in a lighting district recently created, which will be improved by the installation of an ornamental lighting system. Reported that city clerk will shortly issue a call for bids for materials and installation. O.

GREAT FALLS, MONT.—A lighting district comprising Second Avenue, North, from Park Drive to Nineteenth Street, wherein an up-to-date ornamental lighting system will be installed, has been created by the City Council. Bids for materials and installation of same, according to reports, will be called for shortly. O.

TERRY, MONT.—The Town Council has granted a franchise to L. H. Gaffney, local, to construct, operate and maintain an electric light plant and distributing lines in this city. Mr. Gaffney purposes expending several thousands of dollars in making the improvement. O.

KENDRICK, IDAHO. — The City Council at a recent meeting granted an electric light franchise to A. V. Dunkle, of Plummer, Idaho, who plans the construction of a plant and distributing system, the plant alone to cost $10,000. Reported active construction will begin at once and that the plant will be ready for operation within two months. O.

EUREKA, CAL. — Announcement has been made here that the Western States Gas & Electric Company will expend in the Eureka Division, $12,000 of the $266,000 bond issue recently authorized by the State Railroad Commission, to carry on necessary improvement work during the ensuing year.

ESCALON, CAL.—The people of Escalon have voted in favor of creating a highway lighting district.

GLASGOW, MONT. — The council

is planning the installation of an electric lighting plant to cost $18,000. Address H. R. Palmer, city clerk.

SANTA ANA, CAL.—Bids are being received for lighting the Buena Park lighting district.

ASHLAND, ORE.—The proposition of issuing bonds in the sum of $25,000, the money to be used in purchasing the electrical equipment and distributing lines in this city of the California-Oregon Power Company, was defeated by a large majority at a recent election. Two utilities viz., the California-Oregon Power Company and the Ashland Municipal Plant occupy this territory. The former has offered to vacate Ashland, providing the local plant would take over its property within the city limits, and purchase necessary current from the California-Oregon Company. The municipal plant, owing to inadequate facilities is unable to care for increasing business. O.

EUGENE, ORE.—Petitions have been presented to the City Council asking for the installation of an ornamental lighting system to be installed on Ninth Avenue, between Olive and Pearl Streets. O.

COLFAX, WASH.—Reported a site located at the northeast corner of Mill and Spring Streets, this city, has been purchased by the Washington Water Power Company, of Spokane, and that the corporation will shortly begin the construction of a two-story fireproof structure to be used as a substation and office.

GOLDENDALE, WASH. — The Klickitat County Commissioners have been petitioned by the Pacific Power & Light Company for a franchise to construct, operate and maintain telephone, light and power transmission lines through the county. This company serves practically every town of any importance in eastern and central Washington. O.

SEATTLE, WASH.—In a recent communication to the City Council, Superintendent of Lighting J. D. Ross urged that immediate steps to be taken looking towards the purchase and development of a power site as an adjunct to the present municipal plant, whose facilities are inadequate to supply the growing demand for municipal light and power. In his communication Superintendent Ross discusses at length the various offers made to the City of Seattle to furnish electric current. Speaking of the offers made by the Schwager-Nettleton Mill Company and the Stimson Mill Company, he said that neither proposition could be seriously considered, as the city can generate current cheaper than either of the companies, and that neither offer can in any way solve the problem which confronts the municipal lighting plant. Mr. Ross states that he will shortly make a definite recommendation looking toward the securing of additional power to the City Council. The Mountain Development Company, through P. H. Hebb, president, has again submitted an offer to the City Council to sell to the city the White River power site for $1,000,000, under the same terms and conditions made in the former offer. Mr. Hebb, as an alternative proposition, agrees to furnish the city with 20,000 continuous horsepower for a period of 20 years, at a rate of one-third cent per kilowatt-hour, and upon one year's notice will furnish any continuous amount in excess of 20,000 horsepower, up to 50,000 horsepower, in the aggregate rate of one-fourth cent per kilowatt-hour for such additional power. The company agrees to commence furnishing current as soon as the plant can be installed, conditional, however, that deliveries shall begin as to the first 20,000 continuous horsepower within 18 months from the signing of a contract by the City of Seattle. Several years ago voters of the City of Seattle voted bonds to purchase the White River plant owned by Mr. Hebb, and the money has never been utilized.

SEATTLE, WASH.—The largest light and power franchise ever asked in King county was recently granted by the County Commissioners to the Puget Sound Traction, Light & Power Company, which serves the largest towns in the Puget Sound District, viz.: Bellingham, Everett, Seattle and Tacoma, and maintains head offices in Seattle. The franchise extends over the entire southern portion of King County, being bounded on the north by the southern limits of Seattle, extending eastward to the summit of the Cascade Mountains, following the Kittitas County line on the east, the Pierce County line on the south and Puget Sound on the west. Practically every small town in this section of King County will be served by the proposed improvement and the power company plans the expenditure of thousands of dollars in making the extensions and connecting up the service, not only with the small towns and villages, but the ranches and dairy farms as well. The insertion of a common-user clause in the grant was asked by the City of Seattle, through its corporation counsel, and the Commissioners granted the request. The City of Seattle for several years has seriously considered extending the lines of the municipal plant into this territory, but inadequate facilities have kept the city from making the extensions. According to Superintendent of Lighting J. D. Ross, when the municipally owned plant can be increased to care adequately for the business which can be gotten in Seattle and has current to spare, extensions will be made into the outlying territory which is included in the franchise recently granted to the Puget Sound Company. O.

TACOMA, WASH.—An ornamental lighting system will immediately be installed on E Street, from Tacoma Avenue to Jefferson Avenue, according to Superintendent of Lighting Collins. Reported that City Clerk Nickeus will shortly issue a call for bids for materials, iron standards, wire, lamps, etc., also for installation of same.

PROPOSALS.

TELEPHONES.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until September 20, 1915, for furnishing 500 camp-type telephones for the Signal Corps. Additional information may be secured by addressing the above-named office.

ELECTRICAL SUPPLIES.—Sealed proposals will be received by the general purchasing officer, the Panama Canal, Washington, D. C., until September 13, 1915, for furnishing, by steamer, free of all charges, on dock either at Colon or Cristobal (Atlantic ports) or port of Ancon (Balboa, Canal Zone, Pacific port), capstans, switchboards, cables and other electrical supplies. For further particulars address the above-named office.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on September 21, 1915, for the following material, delivery to be made at the navy yards mentioned; bidders should send to the Bureau for copies of the schedules desired: One industrial type electric locomotive, Washington, schedule No. 8744; 9,200 solid and cored arc-lamp carbons, Brooklyn, schedule No. 8752; 2,500 sets carbons, to burn white, for Adams-Bagnall arc lamps, Norfolk schedule No. 8750; 3,000 feet interior communication cable, 100,000 feet telephone cord, 27,000 feet twin-conductor wire, Brooklyn, schedule No. 8751; 100 storage-battery testing outfits, 2 range, deflector and cutout switchboards, Brooklyn, schedule No. 8757.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,147. CARBONS.—An American consular officer in the United Kingdom reports that he has had a request for quotations on arc-light carbons. He states that a similar request was recently published, which brought unduly high quotations. The inquirer desires to act as an agent.

NO. 18,149. ELECTRICAL SUPPLIES.—An agency in Italy writes an American consular officer that it wishes to receive printed matter, price lists, etc., from American manufacturers of electrical household appliances, such as flatirons, grills, water heaters, fans, etc. It is stated that the firm has large show windows for display purposes.

NO. 18,152. ELECTRICAL EQUIPMENT.—The commercial agent of the bureau in Chicago is in receipt of a letter from a firm in that city stating that it has an inquiry from a business man in Argentina who is interested in electrical equipment. The inquirer states that he is in a position to sell large quantities of lamps, lamp cord, electrical appliances, etc.

NO. 18,168. ELECTRIC MOTORS.—A firm in Spain writes an American consular officer that it wishes to secure catalogs and full information relative to electric motors. Correspondence should be in Spanish. Bank reference is given.

NEW INCORPORATIONS.

SUPERIOR, WIS.—The Ross Electric Company has been incorporated with a capital of $10,000, by Leslie G. Ross and others.

HAWESVILLE, KY.—The Hawesville Water and Light Company has been incorporated with a capital of $12,000 by W. H. Williams and others.

BATTLE CREEK, MICH. — The Tekonsha Electric Light Company has been incorporated with a capital of $10,000 by W. F. Warner, Davenport, Iowa, and others.

NEW YORK, N. Y.—The Electric Changeable Sign and Illuminating Company, Incorporated (Manhattan), has been organized with a capital of $50,000, to do electrical contracting, sign and illuminating work, etc. The in-

corporators are: M. Freixas, S. Weinstein and P. Weinstein.

LAMONI, IOWA. — The Lamoni Electric Company has been incorporated with a capital of $40,000. The officers are: Albert Carmichael, president; Joseph Roberts, vice-president; H. C. Burgess, secretary, and F. B. Blair, treasurer.

CHICAGO, ILL.—The Cayer Signal Company has been incorporated with a capital stock of $250,000, to manufacture and deal in electrical and mechanical attachments. The incorporators are J. L. Cayer, Frank McDonald and John W. Eskholme. Z.

MARINE, ILL.—The Marine Electric Service Company has been incorporated with a capital stock of $2,500. The company is to supply light, heat and power and accessories and equipment. The incorporators are H. F. Neale, Gertrude Neale and R. S. Sease.

RAMSEY, ILL. — The Wright Brothers Light & Power Company has been incorporated with a capital stock of $8,000. The company is to manufacture and sell light, heat and power. The incorporators are Alva B. Wright, Raymond C. Wright and J. J. Wright. Z.

PERSONAL MENTION.

MR. W. A. EDSON, deputy smoke inspector, has been appointed smoke inspector for the state of Massachussetts, by the Board of Gas and Electric Light Commissioners, at a salary of $2,800. Mr. Edson succeeds the late William H. Gerrish.

MR. CHARLES H. GUCKEL, formerly general manager for the Springfield (Mo.) Gas & Electric Company is opening an electrical engineering office in Springfield. He has also secured the agency for electrical devices and supplies.

MR. A. L. MARTIN, local manager of the Oregon Power Company, at Dallas, has been appointed a member of a Commercial Club committee to arrange for the participation of Polk County in the Manufacturers and Land Products show at Portland, Ore.

DR. WILLIAM H. TOLMAN, director of the American Museum of Safety, New York City, has been made an honorary member of the Statistical Society of Paris, France. The honor is a recognition of the valuable services rendered by him in promoting the health and safety of workers in the various industries. The Statistical Society was organized in 1860 with the object of popularizing statistical information.

MR. H. O. SWOBODA has been retained as consulting engineer for the Spengler-Loomis Manufacturing Company, Chicago, Ill. The company will take up the manufacture of electrical heating appliances and it is expected that some devices will be ready for the market in about two months. Mr. Swoboda has had an extended experience not only as a consulting engineer, but as an expert in the design and manufacture of electrical heating apparatus.

MR. W. H. FLANDREAU, recently re-elected president of the International Association of Municipal Electricians, by a unanimous vote, has been a resident of Mt. Vernon, N. Y., for the past 21 years and city electrician for 20 years of that time. He is a native of Westchester County, New York, and for years has been prominently identified with electrical and fire department circles of that section. For 10 years he was one of the directors and president for two terms of the Hudson County Volunteer Firemen's Association of New York, and is also a member of the New York State Chiefs' Association. He formerly was connected with the Postal and Western Union Telegraph Companies and with independent telephone companies of that section.

W. H. Flandreau.

MR. CLARENCE R. GEORGE, of Houston, Texas, who was re-elected secretary of the International Association of Municipal Electricians, as reported in our last issue. has already served four years in that capacity. During the time he has served the Association in that position he has been regarded as one of its most conscientious and painstaking officials, and is exceedingly popular, not only with the entire membership, but in electrical circles generally throughout the country. Mr. George has served as city electrician in Houston, his home town, for nearly 17 years, through various city administrations, and is prominently identified with electrical interests throughout the Southwest. He is one of the early members of the Jovian Order, which had its inception in Austin, Tex., and is prominent in its councils.

Clarence R. George.

OBITUARY.

MR. EDWARD B. MOORE, who for years was Commissioner of Patents and therefore in charge of the United States Patent Office, died on September 7 at his home in Washington, D. C. Mr. Moore was 63 years of age. For about 30 years he was connected with the Patent Office, occupying various positions and receiving steady promotion, until he was appointed Commissioner of Patents in 1907. He held this position until August, 1913. He took a prominent part in the negotiation of many treaties relating to patents during his administration and represented the United States at several international congresses. He was born at North Anderson, Me.

NEW PUBLICATIONS.

UNITED STATES MINING STATUTES.—The United States Bureau of Mines has just issued Bulletin 94, "United States Mining Statutes Annotated," in two volumes of 1,772 pages, which is now being sold by the Superintendent of Documents, Government Printing Office, Washington, D. C., at $2.50 a set. This bulletin is a compilation of all sections of the United States Revised Statutes and of all acts of Congress relating to mines, mining, mineral lands and the mining industry on the public lands. It is intended for persons engaged in mining enterprises that come within the scope of Federal mining laws and as a guide as to the determination of mining rights and duties. It shows the status of every Federal mining law, both laws relating to metal mining and those relating to coal, oil and phosphate and to mining on public, Indian and railroad lands. The bulletin relates only to the United States mining laws and does not include any of the laws of the different states in regard to mining. Another bulletin which the Bureau of Mines hopes to print in the future will contain the state laws.

STANDARDS FOR RUBBER-COVERED WIRES.—Underwriters' Laboratories, Incorporated, has issued in book form the standards for rubbered-covered wires and cables. This book is in six parts, of which the first deals with the general nature of the Label Service of the Underwriters' Laboratories. Section 2 describes the work of inspections at wire factories and the use of labels on rubber-covered wires. Section 3 gives the National Electrical Code specifications for the construction and test of rubber-covered wires and cables. Section 4 gives the Laboratories' standards for methods and machines in testing rubber compounds used for insulating wires and cords; both chemical and physical test methods are described. Section 5 describes the field follow-up system in the method of testing market samples. Section 6 explains the system of monthly summaries and demerit schedules.

DATES AHEAD.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, Native Sons of the Golden West Building, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33

West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting. Clift Hotel, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

International Engineering Congress, Civic Auditorium, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association and its affiliated associations. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention. Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Hughes Electric Heating Company, Chicago, has been awarded a gold medal for its ranges and bakers' ovens displayed at the Panama-Pacific International Exposition, at San Francisco.

National Metal Molding Company, Pittsburgh, Pa., is sending out leaflets calling attention to the merits of its Flextube double compounded seamless interwoven flexible conduit.

Wagner Electric Manufacturing Company, St. Louis, Mo., has had reprinted from the *Proceedings* of the American Institute of Electrical Engineers for last May the paper prepared by its consulting engineer, Val A. Fynn, entitled "Classification of Alternating-Current Motors." This is one of the papers presented before the thirty-second annual convention of the American Institute held at Deer Park, Md., at the end of last June.

Electric Fuseguard Company, 391 Mulberry Street, Newark, N. J., has issued catalog No. 1 covering its line of safety inclosed fuses, electrical protective equipment and supplies for railway, signal, light and power, telegraph and telephone circuits. This line of products includes not only inclosed fuses of standard construction but a great assortment of fuse boxes, cutout blocks, service switches and hoods and other supplies of this type for a great variety of circuits.

Edwards Lighting Fixture Company, 605 East Lake Street, Chicago, Ill., has issued its catalog E 2 of electric fixtures which it has ready for immediate shipment. This is a very attractive catalog of 78 pages containing fine illustrations and data on a large variety of ornate fixtures of the most modern type. The designs include very simple as well as more elaborate patterns in the way of pendents, shower fixtures, indirect and semi-indirect fixtures, brackets, etc.

Hotpoint Electric Heating Company, Ontario, Cal., recently had as special guest at a luncheon of its executives at the Casa Blanca Hotel, Ontario, the head of the Research Department of the Curtis Publishing Company, Charles Coolidge Parlin, who delivered a very interesting address in which he outlined the methods of his company to determine for its advertisers the manner in which they can get the very best results in sales campaigns. The meeting was attended by the officers of the company and the executive heads of its various departments.

Delta-Star Electric Company, Chicago, Ill., has purchased a tract of land at the corner of Fulton Street and Artesian Avenue with good railroad shipping facilities. The company is preparing to build a new manufacturing plant on these premises. The plans have been completed for the first building, which will cover an area of 99 by 110 feet. It will be a brick structure with sawtooth roof. Additional buildings will be erected later. The new plant will be thoroughly modern and of highest type of construction and will greatly increase the facilities of the company, which is now located at 631 West Jackson Boulevard.

Record of Electrical Patents

Issued by the United States Patent Office, August 31, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,151,555. Process and Apparatus for Drying Pots. W. E. Barnes, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. Electric heating element below and in the pot.

1,151,563. Machine for Manufacturing Insulating Boards from Fibrous Material. A. G. Brown, assignor to Union Fibre Co., Winona, Minn. For making insulating boards from material carrying an excess of water.

1,151,605. Heater. T. C. Morgan, Chicago, Ill. Includes electric heating element.

1,151,649. Inhaler. D. M. Barr, Philadelphia, Pa. Air is electrically heated and inhaled through tube having impregnating device.

1,151,683. Telephone System. H. L. Harris, assignor to Garford Mfg. Co., Elyria, O. Arrangement of cord circuits, signals, etc., for connection of common-battery and magneto substation lines at main station.

1,151,706. Electric Welding Machine. F. Müller, assignor to Pratt & Whitney Co., Hartford, Conn. Structure and mounting of connection and work holders in resistance type machine.

1,151,707. Electric Relay or Repeater. T. A. Nathans, New York, N. Y. Voice currents relayed in telephone system by converting them into heat which acts on magnetite in derived circuit to vary its conductivity.

1,151,720. Electric Railway Signal System. J. J. Ruddick, assignor to United States Electric Signal Co., West Newton, Mass. Block system for electric roads deriving signaling current from power circuit.

1,151,726. Horn-Gap Lightning Arrester. E. O. Schweitzer, and N. J. Conrad, assignors to Schweitzer & Conrad, Incorporated, Chicago, Ill. One horn is in sections connected by high resistance and connected with terminal by high resistance [illegible] fuse. (See cut on next page.)

1,151,739. Circuit-Breaker. C. A. Tucker, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Operating mechanism for laminated-brush, carbon-break circuit-breaker.

1,151,741. Electric Motor Wheel. W. D. Valentine, assignor to National Rapid Transit Co., New York, N. Y. Structure of wheel having motor incorporated therein for monorail system.

1,151,756. Carriage-Return Mechanism for Type-Writing Machines. O. Bennett, Placerville, Cal. Electromagnetically operated.

1,151,757. Type-Writing Machine. O. Bennett. Has adjustable type rack and electrically operated hammer mechanism for striking the type.

1,151,761. Electrical Measuring Instrument. J. L. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Thermometer shows variations of temperature of liquid of known specific thermal capacity in vacuum receptacle containing known resistor.

1,151,783. Protective Apparatus for Alternating-Current Distribution Systems. G. Harlow and K. M. Faye-Hansen, assignors

to Westinghouse Electric & Mfg. Co. Section to be protected has circuit-breaker at each end and includes series transformers whose secondaries are in circuit with resistances and trip coils connected between equi-potential points, balance being destroyed on development of fault.

1,151,796. Relay. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. For telephone circuits; special arrangement of contacts.

1,151,799. Casing for Lamp Sockets, Pendent Switches and the Like. C. J. Klein, Milwaukee, Wis. Manner of locking cap and shell together.

1,151,800. Lamp Socket. C. J. Keith. Has longitudinally divided, two-part, insulating casing.

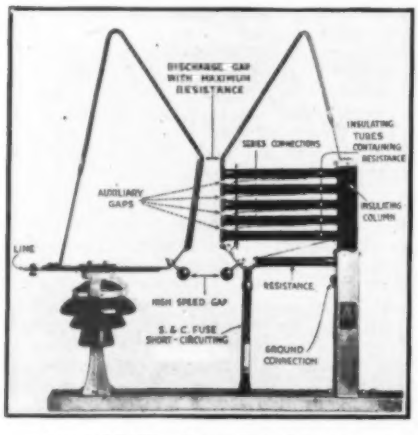
1,151,804. Electric Motor. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Commutator motor for operation on direct or alternating current having greater number of poles of less strength for alternating than for direct-current operation.

1,151,824. Electric Condenser. G. Reuthe, assignor to Gesellschaft für Drahtlose Telegraphie M. B. H. Berlin, Germany. Pack of sheet-metal electrode plates and dielectric plates immersed in liquid dielectric.

1,151,828. Circuit Closer. F. E. Schinke, Chicago, Ill. Has pair of contact plates which may be rocked in several directions and spring normally holds them inoperative.

1,151,841. Electric Arc Lamp. W. C. H. Wefel, assignor of 49 per cent to S. R. Whitaker, H. D. Bartlett and A. S. Whitaker, Denver, Colo. Mechanism for operating lamp having convergent electrodes and bridge for starting arc.

1,151,848. Automatic Time Switch. M. H. Avram, assignor to Slocum, Avram & Slocum, New York, N. Y. Contacts operated by plunger driven through air cushion between pistons in cylinder.



No. 1,151,726.—Horn-Gap Arrester.

1,151,860. Dynamo-Electric Machine. A. J. Brown, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Commutator structure maintaining true surface under expansion and contraction of bars.

1,151,867. Wireless Controlled Steering Mechanism. K. Dougan, Minneapolis, Minn. For torpedoes, etc.; electromagnet controls gearing of constantly running motor with rudder, and has its circuit controlled by wireless.

1,151,946. Ignition System. C. Hartmann, assignor to Gould Coupler Co., Depew, N. Y. For gas engines; has provision for alternately using direct and alternating current and either of two interrupters may be used.

1,151,953. Traffic Signal for Automobiles. C. M. Keenan, Detroit, Mich. Outer casing having display openings has interior rotatable translucent casing containing lamp and bearing appropriate words of direction changeably visible through display openings.

1,151,954. Automatic Photographic Printing Machine. T. C. Korsmo and T. C. Olson, Madison, Wis. Electric motor for manipulating sensitized paper with relation to negative and electric light for printing are automatically controlled.

1,151,981. Trolley-Operated Contact. C. W. Ward, East St. Louis, Ill. Switch on pole connected with hanger by lever and operated by upward pressure of passing trolley wheel.

1,151,991. Reversing Mechanism for Electrically Driven Washing Machines. F. Balzer, assignor to Troy Laundry Machinery Co., Chicago, Ill. Electric motor continuously drives commutator for individually reversing the machine motors at regular intervals.

1,152,005. Coupling Connector for Submarine Cables. L. R. Clark, Englewood, N. J. Special terminal heads for use with wire-armored cables.

1,152,007. Headlight. C. W. Dake, assignor to Pyle National Electric Headlight Co., Chicago, Ill. In reflector arrangement, lamp is located at point whereat coincide foci of front and rear parabolic reflectors and center of intermediate reflector which is section of sphere.

1,152,008. Warning Signal Device. W. W. Dean, assignor to Garford Mfg. Co. Electromagnetically operated automobile horn permits draft through it to remove dust, etc., as vehicle moves forward.

1,152,018. Telegraph Circuit. J. J. Ghegan, Newark, N. J. For code signaling; has divided battery and means for rendering one battery section ineffective when the other is ineffective.

1,152,027. Temperature Regulator. F. T. Kitchen, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Thermostat in apartment controls electromagnet which controls heater circuit.

1,152,059. Type-Printing Electric Telegraph System. W. S. Steljes, South Tottenham, London, England. Receiving instrument has electromagnetically operated type wheel and paper roll moved by electromagnet against type wheel.

1,152,062. Automobile Lock Switch. C. G. Terfler, Chicago, Ill. Cover of casing can be removed only when switch is in certain position.

1,152,082. Electric Flashlight Lamp or Lantern. A. L. Edwards, assignor to Wheeling Stamping Co., Wheeling, W. Va. Lamp, switch, etc., mounted on plate adapted to be secured to top of dry cell.

1,152,085. Sparker for Explosive Engines. W. H. Ferguson, Columbus, O. Has a pair of contacts, one of which is moved into sparking position by rotary member and other contact is moved into such position by the rotary member through tension device.

1,152,088. Relay. L. A. Hawkins, assignor to Union Switch & Signal Co., Swissvale, Pa. Frequency-selective relay energized by split-phase coils from a single-phase circuit arranged to neutralize the magnetomotive forces at a given frequency, the resultant operating the movable element at another frequency.

1,152,092. Method of Advertising and Apparatus Therefor. F. T. Hopkins, assignor to Thos. Cusack Co., Chicago, Ill. Manner of arranging subject matter, etc., in a flashed sign.

1,152,094. Railway Car Signal. J. E. Johnson, Anderson, Ind. Signal lamp switches operated by track device and interlocked to open previously closed switches when one is closed.

1,152,096. Braking Apparatus for Electrically Propelled Vehicles. P. N. Jones, Pittsburgh, Pa. Motors controlled electromagnetically by master controller may be thrown into a dynamic-braking circuit by manually operated means independent of master controller.

1,152,116. Lock for Boxes. W. G. Magoveny, assignor to Crouse-Hinds Co., Syracuse, N. Y. Details of outlet box. (See cut.)

1,152,139. Station Indicator. W. Beck, Rochester, N. Y., assignor of one-fourth each to C. D. Coker, A. J. Aldridge and J. Lewis. Trip-controlled electromagnetic mechanism feeds belt to successively display a series of station names thereon.

1,152,146. Sign. A. F. Conner and G. L. Willett, assignors to Thos. Cusack Co. Hollow open front sign letter has inside lamps and different colored lamps adjacent the outer side surfaces to represent shading.

1,152,147, 1,152,148 and 1,152,149. Electric Fuse. C. W. Davis, assignor to Standard Underground Cable Co., Pittsburgh, Pa. First patent: Structure for mounting between cable terminals in junction box having fuse in casing with expulsion opening and immersed in oil. Second patent: Similar purpose; fuse has high and low fusing portions with tension device acting on high-fusion portion to widen gap on blowing of low-fusion portion. Third patent: Junction box for oil fuses with fuse secured to cover and means for preventing expulsion of oil from casing while cover is being placed in position.

1,152,155. Electric Flashlamp or Lantern. A. L. Edwards, assignor to Wheeling Stamping Co. Casing for dry cell carries lamp, switch and connectors adapted to engage with cell terminals.

1,152,170. Attachment Plug. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport Conn. Particular structure including a switch.

1,152,177. Priming Spark Plug. I. R. Hicks, Hallsville, Mo. Details of device having means for introducing gasoline for priming.

1,152,211. Secondary Rack. C. L. Peirce, Jr., Pittsburgh, Pa. Jib cranes joined for supporting insulator rod.

1,152,219. Automobile Headlight. C. Reinker, Lakewood, O. Reflector has unshaded lamp in center and pair of shielded lamps, one colored, at edge.

1,152,246. Battery Cell. W. L. Walker, Groton, Conn. Has inner and outer acid-resisting jars, the inner being non-conducting.

1,152,247. Battery Jar. W. L. Walker, New London, Conn. Inner and outer jars have ventilating air passages between them.

1,152,269. Trolley Retriever. E. Benson, Hartford, Conn. Details of clutch and resetting mechanism.

1,152,272. Electric Spark Gap. H. Boas, Berlin, Germany. For producing quickly quenched vibrations; has electrodes of tungsten.

1,152,283. Train Stop. J. G. Brinson, assignor of one-half to A. V. Scott, Idaho Falls, Idaho. Track obstacle mechanism electromagnetically operated at will from a distance.

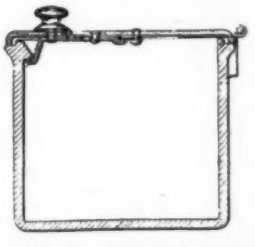
1,152,287. Telegraph Transmitting Instrument. G. T. Buchanan, Highland Park, Mich. Depression of one of key levers, each representing a letter or character, operates Morse key to send corresponding letter or character.

1,152,336. Telephone Switch. F. S. Meyers, Dewitt, Iowa, assignor of one-half to T. Foley. Details of receiver-hook switch.

1,152,344. Insulated Rail Joint. E. F. Schermerhorn, assignor to Rail Joint Co., New York, N. Y. Joint bar insulated from rail and metal chafing guard between bar and insulation at head of rail.

1,152,362. Electric Protective System. E. G. Waters, Forest Row, England. Relates to arrangement for discriminately cutting out cable sections by fault current.

1,152,370. Slotted Signal Lever. J. L. D. Langdon, assignor to General Railway Signal Co., Gates, N. Y. Interlocking machine for operating railway signals comprises electromagnetically operated mechanism.



No. 1,152,116.—Outlet-Box Lock.

1,152,376. Motor Control System. J. H. Albrecht, assignor to Westinghouse Electric & Mfg. Co. In dynamic braking, resistors in field and armature circuits are controlled by braking current.

1,152,385. System of Supervision for the Apparatus of a Telephone or Other System. A. E. Keith, assignor to First Trust & Savings Bank, Chicago, Ill. Particular arrangement of heat-coils and signals in telephone exchange for locating abnormal heat-coil.

Patents Expired.

The following United States electrical patents expired on September 6, 1915:

610,190. Secondary Battery. G. J. Miller, Kenton, O.

610,197. Controlling Device for Electric Elevators. N. P. Otis and R. C. Smith, Yonkers, N. Y.

610,229. Electric Clock Train. C. M. Crook, Elgin, Ill.

610,274. Telautograph. L. O. McPherson, Highland Park, Ill.

610,278. Telegram Transmitter. E. Porter, Sydney, New South Wales, Australia.

610,339. Telegraph Tape. F. Atherton, Paterson, N. J.

610,347. Telephone. W. A. Drysdale, Philadelphia, Pa.

610,393. Telephone. S. S. Fisher, San Francisco, Cal.

610,402. Electric Switch. R. L. L. Hundhausen, Wilmersdorf, Germany.

610,406. Resistance and Contact Apparatus for Electric Currents. H. Lyon, Glasgow, Scotland.

610,413. Direct-Current Regulator. F. E. Ramsey, Walsenburg, Colo.

610,445. Electric Railroad. J. C. Henry, Denver, Colo.

610,509. Means for Controlling Voltage and Volume of Electrical Currents. H. Williams, Cleveland, O.